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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

Bar codes: D236414

SUBJECT: Section 3 Registration Eligibility Decision Chapter for Fipronil Use on Cotton

FROM: William Evans, Biologist 6/19/01
for James Hetrick, Ph.D., Soil Chemist Sid Abel 6/20/01
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Environmental Risk Branch 1
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THRU: Sid Abel, Acting Branch Chief Sid Abel 6/20/01
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TO: Ann Sibold, PM Team Reviewer
Registration Division

The Environmental Fate and Effects Division (EFED) has completed its review of the potential ecological risks and drinking water exposure assessment associated with a FIFRA Section 3 registration of fipronil for use on cotton to control thrips and plant bugs (Lygus), fleahoppers, and boll weevil.

Attached at the end of the document are copies of the reviews (DERs) of two important studies relating to the use of fipronil on cotton. The first of these is the field dissipation study (MRID # 44262826) which provides upgradable supplemental data on the terrestrial field dissipation of fipronil and degradation products in cotton and potato management systems. The second is the aquatic metabolism study (MRID # 44661301) which provides marginally acceptable data on the degradation of fipronil in aquatic systems.

If there are any questions about this review please direct them to Bill Evans or Jim Hetrick.

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Fipronil
Environmental Fate and Ecological Effects Assessment and Characterization for a Section 3 on Cotton

Due to the extreme risk to aquatic organisms mitigation below levels of concern is impractical. This is especially true for aquatic invertebrates. In order to reduce risk to aquatic organisms, the following measures might be considered.

1. Limit use to certified applicators only. Current labels are not restricted to certified applicators only.
2. Consider ground spray only applications to reduce drift
3. Consider the use of an aquatic buffer zone to protect aquatic ecosystems.
4. Reduce the use rate and or the number of applications, if feasible.
5. Reduce applications in consecutive years.

II. Introduction

Fipronil is a selective insecticide currently registered on turf, in-furrow corn and seed treated rice. According to the manufacture's data, fipronil affects the gamma-aminobutyric acid receptor-mediated system in nerve cells and thereby affecting the polarization of the neural membrane by interfering with the passage of chloride. In addition, research data indicate that fipronil displays a higher potency in insect GABA chloride channel than in the vertebrate GABA chloride channel. This may indicate selective toxicity. However, the selectivity of parent fipronil for the insect GABA receptor is not exhibited by the toxic photodegradate (MB46513).

The current registration application is for a Section 3 use in all cotton growing regions of the U.S. Specific information about this proposed registration is presented below.

Barcode: D236414
Chemical Name: Fipronil: 5-amino-1-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4-((1,R,S)-(trifluoromethyl) sulfinyl)-1-H-pyrazole-3-carbonitrile
Chemical Type: Phenylpyrazole insecticide
CAS #: 120068-37-3
PC Code: 129121
Active Ingredient Name: Fipronil
Product Trade Names: Regent 80 WG, Regent 2.5 EC

Submission and Label Information

Section 3 Registration of two new products containing the active ingredient fipronil on cotton. The REGENT® 80 WG formulation is restricted for retail sale and use by certified applicators only, due to toxicity to estuarine invertebrates and birds. The REGENT® 2.5 EC formulation does not currently have the same restrictions.

Use Characterization for Cotton Use Pesticides

According to Agricultural Statistics, 1994 (USDA) over 13.4 million acres were planted in 1993 in 17 states. The largest cotton-producing state is Texas (5.5 million acres). The table below lists all the cotton growing states in order of the number of acres planted.

State	***Number of Acres Planted (thousands of acres)***
Texas	*5,550*
Mississippi	*1,330*
California	*1,050*
Arkansas	*990*
Louisiana	*890*
Tennessee	*625*
Georgia	*615*
Alabama	*443*
North Carolina	*390*
Oklahoma	*370*
Missouri	*345*
Arizona	*316*
South Carolina	*202*
Florida	*54*
New Mexico	*53.5*
Virginia	*17.7*
Kansas	*1.8*

Much of the cotton production area includes ecologically sensitive ecosystems. Among these areas are valuable freshwater and estuarine ecosystems. These ecosystems cover large areas of land in the Mississippi delta. Off-site movement of chemicals applied to cotton fields in these counties is expected to enter estuarine areas which support important marine fishery resources and wildlife communities.

Target Organisms

The target organisms for cotton uses of fipronil include thrips and plant bugs (Lygus), fleahoppers, and boll weevil.

Formulation Information

REGENT 80 WG is a dry powder flowable water dispersable formulation, applied by aerial or ground methods as a foliar spray*. **Use restricted to Certified Applicators.**

**Active Ingredient:
Fipronil..80%
Inert Ingredients..................................20%
* Corn is applied as in-furrow applications only.
**Contains 0.833 pounds of active ingredient per pound of product.

REGENT 2.5 EC is an emulsifiable concentrate, water dispersable formulation, applied by aerial or ground methods as a foliar spray.

*Active Ingredient:
Fipronil..80%
Inert Ingredients..................................20%
*Contains 2.5 pounds of active ingredient per gallon of product.

Application Methods, Directions, and Rates

Application Timing

80 WG: Apply using aerial or ground equipment when insect populations reach recognized threshold levels or when past experience indicates the probability of damaging insect infestations. Single applications range from 0.025 to 0.037 lb ai/A for control of thrips and 0.037 to 0.05 lb ai/A for plant bugs, flea hoppers, and boll weevil. Repeat applications up to a maximum 0.2 lb ai/A per season.

2.5 EC: Apply using aerial or ground equipment when insect populations reach recognized threshold levels or when past experience indicates the probability of damaging insect infestations. Single applications range from 0.025 to 0.037 lb ai/A for control of thrips and 0.037 to 0.05 lb ai/A for plant bugs, flea hoppers, and boll weevil. Repeat applications up to 0.2 lb ai/A per season.

Use is not restricted to Certified Applicators.

Environmental Hazard Statements (excerpted from labels)

REGENT 80 WG Label Only

"This pesticide is toxic to birds, fish, and aquatic and estuarine invertebrates. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Cover, incorporate, or clean up granules that are spilled. Do not contaminate water when disposing of equipment wash water or rinsate."

"This pesticide is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area."

REGENT 2.5 EC

"For terrestrial use. This pesticide is toxic to birds and aquatic and estuarine organisms (fish and invertebrates). Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters."

III. Integrated Environmental Risk Characterization

Aquatic Risk Characterization

Surface water modeling indicates that fipronil and its degradates can move into surface waters through off-site drift or runoff from aerial applications on cotton. Due to the persistence of the fipronil and its degradates, fipronil residues may be expected to be available for months to years after application and hence are expected to be available for runoff into surface waters. The dissipation of fipronil in aquatic environments is expected be controlled by microbial-mediated degradation and photodegradation. There is some uncertainty regarding the persistence in aquatic environments because fipronil shows more persistence in soil environments when compared to aquatic environments. The degradation products are expected to be more persistent in aquatic environments with sorption onto sediment a route of dissipation.

Surface water modeling indicate fipronil concentrations are expected to exceed a daily peak value of 2.9 μg/L and a 60 day average concentration of 1.4 μg/L.. The resulting risk quotients (Appendix C, Table 9) show that acute risk quotients are exceeded for freshwater and marine invertebrates by more than 6 and 20 fold, respectively. There is some uncertainty about the risk to freshwater aquatic invertebrates due to the range in acute toxicity values (0.43 μg/L for *Chironomus tepperi* to 190 μg/L for the least sensitive daphnid). To reduce the uncertainty associated with the risk to fresh water invertebrates additional acute and chronic testing for freshwater species such as mayflies, stoneflies, and caddis fly larvae should be conducted. Chronic risk to marine fish is demonstrated at peak, 21-day, and 60-day water concentrations and levels of concern are exceeded for freshwater and marine invertebrates and range from 65X for freshwater invertebrates to 584X for marine invertebrates.

Degradate modeling was conducted assuming the maximum conversion efficiency in the environmental fate laboratory studies The maximum conversion efficiency was 24% for MB 46136, 43% for MB46513, and 5% for MB 45950. It should be noted that the maximum conversion efficiency can be greater than 5% for MB45950 , but was not used in the modeling because higher conversions were seen in anaerobic sediment environments, conditions not likely to be seen in most inland surface waters.

Because of the high persistence of the fipronil degradation products, accumulation can be expected to occur in the field pond. Degradate modeling shows that 1 year accumulated peak values for the MB 4590, MB46136, and the MB 46513 are 0.7, 2.9, and 5.5 μg/L, respectively. The model predicts a 20 year accumulation which is expected to result in peak water concentrations of 2.0 μg/L for MB 45950, 7.1 μg/L for MB 46136, and 21.8 μg/L for MB 46513.

Although the EFED would normally use the 20 year peak concentration to calculate chronic risk quotients, EFED used the 1 year peak concentrations to calculate the risk quotients (see Appendix C, Table 11). Using the one year peak concentration, the risk quotients for all degradates except MB45950 exceed chronic levels of concern for fish. The chronic levels of concern are exceeded by more an order of magnitude for marine fish (except MB 45950) and more than 3 orders of magnitude for marine invertebrates, except MB 45950. Acute, restricted use, and/or endangered species levels of concern are also exceeded for all degradates with the exception of the MB 45950 degradate for freshwater fish and invertebrates.

Acute levels of concern are exceeded for the freshwater chironomids when comparing toxicity to pore water concentrations for MB46136 and MB 46513. The freshwater RQ for MB 45950 exceeded the acute restricted and endangered species with a risk quotient of 0.33. No chironomid chronic studies were submitted for any of the degradates, however, chronic effects demonstrating RQs ranging from 2.53 to 250 are observed if one assumes that the freshwater daphnid acute/chronic ratio is applied to chironomids. To reduce the uncertainty associated with the risk to fresh water invertebrates additional acute and chronic testing for freshwater species such as mayflies, stoneflies, and caddis fly larvae must be conducted.

The results of acute chironomid sediment toxicity tests show acute pore water toxicity concentrations are considerably higher than the most sensitive freshwater daphnid (29 ppb versus 0.41 ppb for the MB 46136 degradate). The resulting acute risk quotients range from 0.33 to 7 for the MB 45950 and the MB 46136 degradate, respectively (Appendix C, Table 11). Chronic toxicity tests and testing on the parent and MB 46513 have not been submitted. These tests as well as acute and chronic testing on marine/estuarine sediment toxicity tests should also be submitted. However, an estimate of freshwater chronic sediment toxicity was determined by assuming that the chronic to acute ratio for daphnid studies would also apply to sediment dwelling chironomids. The resulting values obtained from this calculation suggest that chronic risk quotients range from 2.5 to 181 for chironomids.

Risk quotients have been demonstrated to be well below the acute and chronic levels of concern for aquatic plants. Therefore, no further testing or presumption of risk is noted.

Terrestrial Risk Characterization

The environmental fate data indicate that fipronil and its degradates are persistent and relatively immobile in terrestrial environments. The high persistence of the fipronil degradation products is expected to result in seasonal accumulation in terrestrial environments. Foliar application of fipronil on cotton will cause preferential formation of MB46513 through photodegradative processes on leaf and soil surfaces.

The estimated environmental residue concentrations expected to result from the large acreage and diversity of species represented by cotton production is expected to be significant. The EFED uses several methods to estimate the exposure to birds and small mammals. For screening risk assessment purposes, residues found on typical avian or mammalian food items from Hoerger and Kenaga (1972) as modified by Fletcher et. al.(1994) are used to calculate the estimated environmental concentrations and compared to the dietary LC_{50}. The results from this analysis demonstrated restricted use and endangered species level of concern exceedances on all food types except seeds and chronic risks for consumption of foods with residues commensurate with those assumed for short grass (Appendix C, Tables 1 and 2). However, when the LC_{50} is less than or equal to 50 mg/kg-diet, the EFED policy suggests that the LD_{50} value is often a better indicator of acute toxicity to birds for acutely toxic pesticides. To make use of the LD_{50} endpoint in calculation of a risk quotient, an estimate of the amount of pesticide that a bird is likely to ingest in a single day is calculated for 20 g, 100g, and 1000 g birds. The resultant fipronil parent RQs from this method range from 0.01 to 1.21 for a single application and from 0.01 to 3.9 for multiple applications. These RQs exceed the acute risk level of concern in at least one food item type for all weights of birds (multiple applications)(Appendix C, Table 3). For a single application short and tall grass residues trigger acute concern for only the smallest bird weight class. For the MB 46513 degradate acute risk RQs range from 0.01to 9 and exceed the acute risk LOC for all weight classes of birds and for all food types except seeds (Appendix C, Table 4).

Chronic risk quotients (Appendix C, Table 1) for birds for a single application of fipronil ranged from 0.01(seed consumption) to 1.2 (short grass consumption), with only the short grass RQ exceeding the EFED LOC. For multiple applications (Appendix C, Table 2) the risk quotients suggest potentially greater risk (RQs ranging from 0.25 to 3.9) and over a greater number of food types (broadleaf plant, insects, tall grass and short grass residues estimates all exceed the EFED LOC).

The registrant submitted a field study (MRID # 451359-01) which measured actual field concentrations of fipronil and its metabolites on seeds, worms and insects. The application rate of 0.075 lb ai/A was higher than the proposed label rate of 0.05 lb ai/A. The application intervals was 7 to 10 days with a maximum 4 applications per year. The residues and conclusions of this study generally follow the Agency's conclusions regarding risks associated with consumption of these seeds and insects. However, the study did not address residues in broadleaf plants or grasses; the food types of most concern according to EFED's modeling. By Comparing the relationship between measured seed residues and application rate for both the EFED exposure model and the registrant's field study results, is possible to use the available data for seeds from the field study to make inferences regarding EFED's modeling approach for broadleaf plants and grasses. For the registrant's study, seed residues normalized to 1 lb ai/acre, yields a residue of 62 ppm/lb ai/acre. A similar normalization to 1 lb ai/acre for EFED modeled seed residues, yields a residue of 49 ppm/lb ai/acre. This suggests that EFED's residue estimates are less conservative and if the relationship holds for other vegetative matter also suggests that EFED's modeled residue estimates for grasses and broadleaf vegetation may be **less** conservative than would be expected if residues in these food types were actually measured.

Acute levels of concern for small mammals are exceeded only for15 and 35 g herbivores/insectivores. Chronic levels of concern are only exceeded for small mammals foraging in short grass.

Terrestrial plant data are generally not required on insecticides unless scientific literature reveals an effect on plants. A literature search conducted by EFED revealed that continuous seed exposure to fipronil (four days) at 2000 mg/L significantly impaired seed germination in rice. However, the EFED calculated an equivalent concentration of 0.52 mg ai/L based on the maximum use rate for rice of 0.05 lb ai/A. This concentration is well below the 2000 mg/L seed germination impairment endpoint. Therefore, EFED will not ask for terrestrial plant data at this time, and a terrestrial plant risk assessment and characterization will not be done at this time.

Drinking Water Exposure Characterization

The drinking water assessment for fipronil is based on PRZM/EXAMS modeling of the index reservoir because no drinking water monitoring data for fipronil has been submitted to the Agency. There is, however, preliminary surface water monitoring data for fipronil residues (fipronil, MB46513, MB46950, and MB46136) from seed treated rice applications in southern Louisiana. This monitoring was initiated because there is concern fipronil and its degradates have an adverse effect on crawfish production. Although these data indicate fipronil and it degradation products move from the rice paddy into adjoining surface waters, these surface waters are not currently used as drinking water. The maximum concentration of fipronil residues was 8.41 ug/L for fipronil, 1.96 ug/L for MB46513, 0.50 ug/L for MB 46136, and 0.32 ug/L for MB45950. The maximum fipronil concentration measured in surface water exceeded the 1 in 10 year daily peak concentration of 7.1 ug/L from PRZM/EXAMS for the cotton scenario. However, the predicted 1 in 10 year daily concentrations of fipronil degradation products (MB46513, MB46950, and MB46513) did not exceed the concentrations found in the monitoring program.

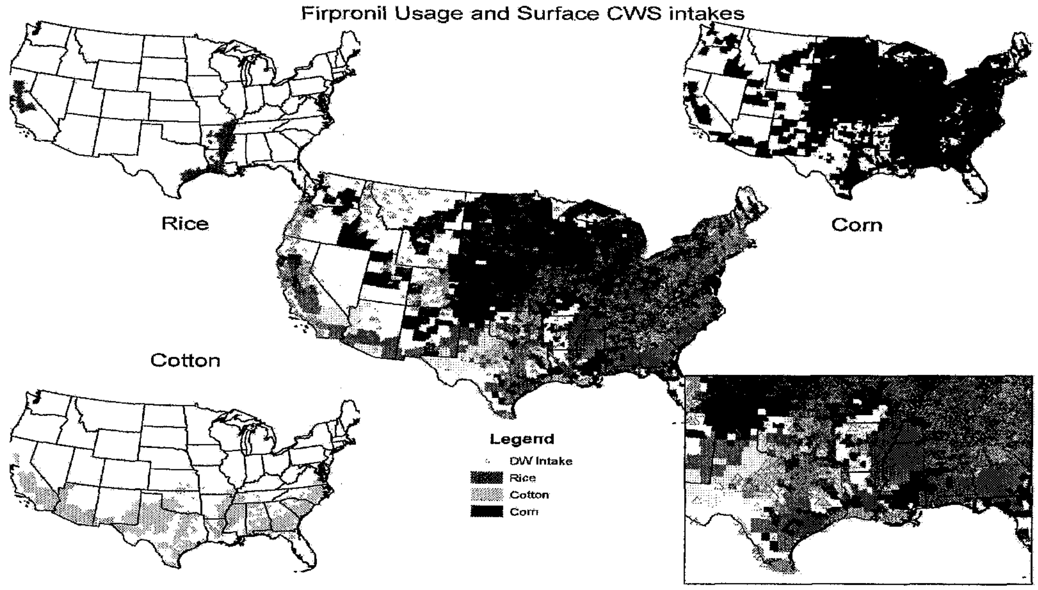
PRZM-EXAMS modeling for fipronil and its degradation products was conducted for individual compounds rather than total toxic residues (fipronil, MB46136, MB45950, and MB46513). This approach was selected because there were ample environmental fate data on the individual fipronil residues to allow for Tier II modeling. This approach was also used because, modeling total toxic residues is expected to skew estimated concentrations toward the properties of the most persistent and mobile compounds.

The conversion efficiency of the fipronil degradation products were estimated assuming the maximum conversion efficiency (that is highest percent formation) from parent fipronil. Formation kinetics were not used in the assessment because the formation of toxic degradation products is highly dependent on the degradation pathway. For example, the photodegradate, MB46513, is a minor degradation product in the aerobic soil metabolism study. However, MB46513 was a important degradate in field dissipation studies for cotton (MRID 44262826). The apparent discrepancy between laboratory and field data can be attributed to the contribution of photodegradation of fipronil on leaf surfaces. The maximum conversion approach required subjective judgement on the formation efficiency of MB46513 and MB45950. The conversion efficiency of MB 46513 is expected to be conservative because it is based on a maximum degradate formation efficiency of 43% of parent from a photodegradation in water study (MRID 42918661). Lower concentrations of MB 46513 have been detected in other environmental fate studies. In contrast, the conversion efficiency of MB45950 is not conservative because high conversion efficiencies (~80%) were observed in aquatic metabolism studies. The high conversion efficiency can be attributed to the anoxic (anaerobic) redox conditions in sediment. Because the modeling scenario in the reservoir represents an aerobic environment, the conversions efficiency from the aerobic soil metabolism study (5% of applied) was used as the first approximation.

Another uncertainty is the half-life of fipronil and its degradates in redox stratified aquatic environments. The aerobic aquatic metabolism data (MRID 44261909) indicate that fipronil has a half-life of 14.5 days in aerobic aquatic environments. These data appear to contradict the persistence of fipronil ($t_{1/2}$=128 to 308 days) in aerobic soil metabolism studies. The registrant has submitted additional aerobic aquatic data showing registrant calculated first-order half-live for fipronil was 16 days for Ongar and 35.62 days for Manningtree sediment/water systems (RPA Document 201604). Based on the available aerobic aquatic metabolism data, the agency calculated a 90th percentile of mean aerobic aquatic half-life for fipronil is 33.7 days. This half-life was used in the EXAMS modeling.

Tier II PRZM-EXAMS modeling using the index reservoir without the PCA refinement indicates that 1 in 10 year fipronil concentrations are 7.1 ug/L for the daily peak (acute), 3.0 ug/L for the 90 day average (non-cancer chronic), and 1.0 ug/L for the annual mean. The 20 year annual average concentration is not likely to exceed 0.4 ug/L. The concentration of combined (summed) fipronil residues are not expected to exceed 33.6 μg/L for the daily peak, 23.2 μg/L for the 90 day average, 11.7 μg/L for the annual average, and 6.2 μg/L 20 year annual average.

Although the OPP policy is to apply the default PCA (PCA=0.86) for compounds with multiple agricultural uses, EFED believes the most appropriate PRZM-EXAMS Tier II screening modeling approach for fipronil is to assume no PCA correction. This approach is appropriate because of the multiple registered uses of fipronil such as corn, cotton, rice, urban/suburban turf uses which can coexist in the same geographic area. For example, rice, cotton, corn, and urban/suburban uses can be colocated in some parts of the Mississippi embayment area (See figure below). The use of no PCA assumes that 100% of the 172.5 ha watershed for the index reservoir is treated with fipronil using application rates and techniques (foliar application) stipulated for cotton. This approach is expected to yield a conservative Tier II screen because cotton is expected to have a high probability to impact surface water quality when compared to other fipronil uses (possible exception rice).



The proposed cotton use has a higher application rate coupled with multiple foliar spray applications. These factors are expected to encourage off-site fipronil movement through spray drift . This dissipation pathway alone is expected to contribute 16 percent of the application rate for one treated acre. Additionally, the lack of soil incorporation immediately after foliar application is expected to facilitate higher runoff when compared to the in-furrow uses of fipronil on corn. Other factors leading to the conservatism of the screen is the summation of 1 in 10 year daily peak concentrations. This approach was used because the environmental fate modeling was conducted on individual residues and fipronil and its degradation products are assumed to have equivalent toxicity.

Refinement of the modeling results is expected to invoke additional uncertainty regarding the level of protection in the Tier II assessment. However, the selection of the appropriate PCA refinement is not clear because fipronil has multiple agricultural and urban/suburban uses and these uses are expected to impact fipronil and degradation product's movement into surface water. The default PCA, which represents the highest percent of agricultural land in an 8-digit USGS Hydrologic Unit Code (HUC) and reduces the PRZM-EXAM prediction by 14%, is expected to adequately capture the agricultural uses of fipronil (possible exception rice). It does not, however, capture the impact of urban/suburban uses of fipronil such as mole cricket, fire ants, and flea/tick control. These uses are expected to facilitate movement of fipronil and its degradation products into surface water through stormwater conveyances around suburban and urban areas. The USGS has observed that urban and suburban centers are significant contributors to pesticide loading into surface waters. An accurate assessment on the impact of the urban/suburban uses to the overall fipronil loading into surface is difficult to predict at this time.

Another refinement option is application of the corn-cotton PCA. Because corn and cotton can be grown in the same geographic areas (or colocated), an evaluation on the impact of cotton-corn production on fipronil loading is warranted. The cotton-corn PCA, assumes maximum colocation of corn-cotton in an 8 digit HUC and reduces the PRZM-EXAM prediction by 54%, is not expected to capture the rice uses and the urban/suburban uses of fipronil. With the exception of Mississippi Embayment area, the rice production areas do not appear to be colocated with cotton and corn. Additionally, there are few community water systems (CWSs) in the rice growing region of the southcentral U.S. using surface water source drinking water. For example, there are CWSs using surface source water in northern Louisiana and the Texas rice growing regions. Additional uncertainties are associated with different fipronil application methods on corn and cotton. Because the fipronil use on corn is expected to limit fipronil loading into surface waters (in furrow use only), the use of the corn-cotton PCA correction factor is expected to yield intermediate level of conservatism into the assessment.

The use of the cotton PCA is expected to provide the most uncertainty in the level of protection of the Tier II screening assessment. The cotton PCA, which reduces the PRZM-EXAMS prediction by 80%, is expected to provide a reliable estimate from fipronil use on cotton alone. However, this approach does not consider fipronil loadings into surface water from other colocated uses including corn, rice, and urban/suburban uses. For example, the preliminary rice monitoring data indicate the maximum fipronil concentrations in the southern Louisiana rice growing region (8.41 and 2.114 ug/L) exceed the cotton PCA adjusted daily peak concentration (1.4 ug/L).

IV. Environmental Fate Assessment

Environmental Fate Summary

Based on supplemental and acceptable data, fipronil dissipation appears to be dependent on photodegradation in water, microbially mediated degradation, and soil binding. Data indicate that fipronil is relatively persistent and immobile in terrestrial environments. In aquatic environments, a determination of the environmental behavior of fipronil is more tentative because soil and aquatic metabolism studies provide contradictory data on fipronil persistence to microbially mediated degradative processes. Photolysis is expected to be a major factor in controlling fipronil dissipation in aquatic environments. Fipronil degrades to form persistent and immobile degradates. These degradates are considered in the HED dietary tolerance expression for fipronil. Since fipronil and its degradates have a moderate to high sorption affinity to organic carbon, it is likely sorption on soil organic matter will limit fipronil residue movement into ground and surface waters. However, fipronil residue may have the potential to move in very vulnerable soils (e.g., coarse-textured soils with low organic matter content). In-furrow fipronil application are expected to limit runoff potential. Foliar applications of fipronil are expected to encourage spray drift as a route of dissipation.

The chemical degradation of fipronil appears to be dependent predominately on photodegradation in water and, to a lesser extent, on alkaline-catalyzed hydrolysis. Fipronil is stable ($t_{1/2} > 30$ days) in pH 5 and pH 7 buffer solution and hydrolyzes slowly ($t_{1/2}$=28 days) in pH 9 buffer solution. The major hydrolysis degradate is RPA 200766 (5-amino-3-carbamoyl-1-(2,6-dichloro-4-trifluoromethylphenyl)-4-trifluoro-methanesulfinyl pyrazole. Photodegradation of fipronil is a major route of degradation (photodegradation in water half-life=3.63 hours) in aquatic environment. In contrast, fipronil photodegradation on soil surfaces (dark control corrected half-life=149 days) does not appear to a major degradation pathway. Major photolysis products of fipronil are MB 46513 (5-amino-3-cyano-1-(2,6-dichloro-4-trifluoromethyl-phenyl)-4-trifluoro-methylpyrazole 350, and RPA 104615 (5-amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) pyrazole-4-sulfonic acid).

Fipronil degradation in terrestrial and aquatic systems appears to be controlled by slow microbially-mediated processes. In aerobic mineral soil, fipronil is moderately persistent to persistent ($t_{1/2}$= 128 to 300 days). Major aerobic soil degradates (>10% of applied of fipronil) are RPA 200766 and MB 46136 (5-amino-1-(2,6-dichloro-4-trifluoro methylphenyl)-3-cyano-4-trifluoromethyl-sulphonyl-pyrazole). Minor degradates (<10% of applied fipronil) are MB 45950 (5-amino-1-(2,6-dichloro-4-trifluoromethylphenyl)-3-cyano-4-trifluoro-methyl-thio-pyrazole) and MB46513. These degradation products are not unique soil metabolism degradation products. Fipronil degraded ($t_{1/2}$=14.5 days to 35 days) under stratified redox aquatic/sediment systems. Fipronil also is moderately persistent (anaerobic aquatic $t_{1/2}$ = 116-130 days) in anoxic aquatic environments. Major anaerobic aquatic degradates are MB 45950 and RPA 200766. Supplemental aerobic aquatic metabolism data indicate that fipronil degradation ($t_{1/2}$=14 days) is rapid in aquatic environments with stratified redox potentials. These data contradict the longer fipronil persistence reported in anaerobic aquatic and aerobic soil studies.

Fipronil has a moderate sorption affinity (K_f=4.19 to 20.69 mL/g; 1/n= 0.938 to 0.969; K_{oc}= 427 to 1248 mL/g) on five non-United States soils. Fipronil sorption appears to be lower (K_f< 5 mL/g) on coarse-textured soils with low organic matter contents. Desorption coefficients for fipronil ranged from 7.25 to 21.51 mL/g. These data suggest that fipronil sorption on soil is not a completely reversible process. Since the fipronil sorption affinity correlates with soil organic matter content, fipronil mobility may be adequately described using a K_{oc} partitioning model. Soil column leaching studies confirm the immobility of fipronil.

Conclusions regarding the environmental fate of fipronil degradates, except MB 46513, are more tentative because they are based on a preliminary review of interim data not a formal evaluation of a fully documented study report. Since discernable decline patterns for the fipronil degradates were not observed in metabolism studies, the degradates are assumed to be persistent ($t_{1/2}\approx700$ days) to microbially mediated degradation in terrestrial and aquatic environments. However, the fipronil degradate, MB46136, rapidly photodegrades ($t_{1/2}$=7 days) in water. Radiolabelled MB 46513, applied at 0.1 μg/g, had an extrapolated half-life of 630 or 693 days in loamy sand soils when incubated aerobically in the dark at 25°C. The major metabolite of MB 46513 was RPA 105048 (5-amino-3-carbamoyl-1-(2,6-dichloro-4-trifluoromethylphenyl)-4-trifluoromethylsulfonyl pyrazone).

Fipronil degradation products have relatively low potential mobility because of a moderate to high sorption affinity to soil organic matter. Organic carbon partitioning coefficients for fipronil degradates can range from 1150 to 1498 mL/g for MB 46513, 1619 to 3521 mL/g for MB 45950, and 1448 to 6745 mL/g for MB 46136. The high sorption affinity of fipronil degradates is expected to limit movement into ground and surface water.

Terrestrial field studies confirm observations of the relative persistence and immobility of fipronil residues in laboratory studies. Fipronil, formulated as a 1% granular, had half-lives of 1.1 to 1.5 months on bare ground in North Carolina (NC) and Florida (FL), 0.4 to 0.5 months on turf in NC and FL, and 3.4 to 7.3 months for in-furrow applications on field corn in California (CA), Nebraska (NE), NC, and Washington (WA). Fipronil, formulated as 80WG and applied foliar spray at 0.3 lbs ai/A, had a field dissipation half-life of 159 days on a cotton site in California, 30.2 days on cotton site in Washington, and 192 days on a potato site in Washington.

The fipronil degradates MB 46136, MB45950, and RPA 200766 were detected in the field studies for in-furrow and turf uses. The degradate MB46513 was detected during field trails with the foliar spray. Fipronil residues were predominately detected in the 0 to 15 cm soil depth at all test sites. However, there was detection of fipronil, MB 45950, MB 46136 and RPA 200766 at a depth of 15 to 45 cm for in-furrow treatments on coarse sandy loam soil in Ephrata, Washington. Although the field dissipation half-life of individual residues was not reported, the half-life of combined fipronil residues (including fipronil, MB 46136, MB 46513, MB 45950, and RPA 200766) ranged from 9 to 16 months.

The bioconcentration factor for radiolabelled fipronil was 321X in whole fish, 164X in edible tissues, and 575X in non-edible tissues. Accumulated fipronil residues were eliminated (>96%) after a 14-day depuration period. Because fipronil exhibited a high depuration rate, fipronil is not expected to accumulate under flowing water conditions.

SURFACE WATER ASSESSMENT

Based on the environmental fate assessment, fipronil and its degradates (MB 46513, MB 46136 and MB 45950) can potentially move into surface waters. Since fipronil is used as an aerial application on cotton, off-site movement of fipronil is expected to be dependent on spray drift and runoff. The persistence of parent fipronil ($t_{1/2}$=128 to 300 days) and its transformation products ($t_{1/2}$=700 days) may allow for a substantial fraction of fipronil residues to be available for runoff months to years after a single application. Fipronil and its transformation products have a moderate to high binding affinity (K_d values 4 to 20 mL/g) to mineral soils. Although fipronil and its degradates exhibit moderate organic carbon sorption affinities, these compounds are expected to exist in runoff waters primarily in the dissolved state.

The dissipation of fipronil in surface water should be dependent on photodegradation in water ($t_{1/2}$ = 3.63 hours) and, to a lesser extent, microbial-mediated degradation ($t_{1/2}$ = 128 and 300 days for aerobic soil; 116 to 130 days for anaerobic aquatic; 14 days for aerobic aquatic metabolism). Since photolysis is a major route of degradation for fipronil, its dissipation is expected to be dependent on physical components of the water (*i.e.* sediment loading) which affect sunlight penetration. For example, fipronil is expected to degrade faster in clear, shallow water bodies than in murky and/or deeper waters. Since fipronil and its transformation products have moderate soil-water partitioning coefficients, binding to sediments may also be a route of dissipation.

The following data were used as input for the PRZM/EXAMS modeling of fipronil:

Parameter	***Value***	***Source***
Application rate	***0.056 kg/ha***	***EPA Reg. 264-570***
Soil K_{oc}	***727 mL/g[1]***	***MRID 44039003***
Aerobic soil half-life	***128 days***	***MRID 42918663***
Plotolysis Half-life	***0.16 days***	***MRID 42918661***
Hydrolysis pH 7	***Stable***	***MRID 42194701***
Aerobic Aquatic Half-life	***33.7 days[2]***	***MRID 44661301, 44261909***
Anaerobic Aquatic Half-life	***33.7 days[2]***	***MRID 44661301, 44261909***
Water solubility	***2.4 mg/L***	***EFGWB one-liner***

1- Mean Koc value
2-Represents the 90th percentile of the mean

EFED notes differences in K_{oc} input parameters for current modeling and earlier PRZM-EXAMS surface water modeling. Earlier Tier II assessment was conducted using a mean K_{oc} of 803 mL/g (Mostaghimi, 1996). Subsequent review of the available data suggest that this earlier K_{oc} was an over-estimate. The correct mean K_{oc} of fipronil is 727 mL/g. Although the surface water models are sensitive to K_{oc}, the slight difference in fipronil K_{oc} is expected to only slightly increase the estimated environmental concentrations. The mean K_{oc} was used because there was an observed correlation between K_d and soil organic matter.

The lowest reported half-life of fipronil ($t_{1/2}$= 128 days) was used as the representative aerobic soil metabolism half-life of fipronil. Preliminary analysis indicates the upper 90th percentile half-life value of the mean is much greater than the highest reported value ($t_{1/2}$= 308 days). The highest reported half-life is associated with a low organic matter sand, which likely represents a soil type of limited microbial activity. It should be noted that the use of the lowest half-life is a departure from current EFED policy, which states that the 90th percentile of the mean should be used for modeling purposes. However, the use of the lower half-life is not expected to drastically alter PRZM/EXAMS predictions because the model is relatively insensitive with respect to this parameter for moderately to persistent compounds.

EFED notes that rapid degradation of fipronil ($t_{1/2}$=14 days) in the aerobic aquatic metabolism study is inconsistent with both aerobic soil metabolism and anaerobic aquatic metabolism data on fipronil. Additionally, interpretation of the study results are further confounded by a highly stratified redox potential between the water and sediment phases. These data appear to contradict the persistence of fipronil ($t_{1/2}$=128 to 308 days) in aerobic soil metabolism studies. The registrant has submitted additional aerobic aquatic data showing registrant calculated first-order half-live for fipronil was 16 days for Ongar and 35.62 days for Manningtree sediment/water systems (RPA Document 201604). Based on the available aerobic aquatic metabolism data, the 90th percentile aerobic aquatic half-life for fipronil is 33.7 days. This half-life was used in the EXAMS modeling for KBACW and KBACS; the half-life in water and sediment, respectively.

Spray drift of fipronil was assumed in the modeling scenario. The drift loading in the index reservoir and farm pond was 16% and 5% of a single acre's application rate, respectively.

EFED conducted surface water modeling for the individual degradates including MB 46513, MB 46136 and MB45950. Environmental fate properties of the fipronil degradates are shown in Table 1. The modeling was conducted assuming the maximum seasonal conversion efficiency for the compound was represented by the maximum percentage formed in the environmental fate laboratory studies. The maximum conversion efficiency was 24% for MB 46136 (MRID 42928663), 43 % for MB 46513 (MRID 42918661), and 5 % for MB 45950 (MRID 42928663). It should be noted that anaerobic aquatic metabolism data (MRID 43291704) indicate the conversion efficiency for MB 45950 can be substantially higher than 5% under anoxic conditions. The highest conversion efficiency for MB 45950 was not used in the modeling because it represents anoxic sediment environments. Degradate application was assumed to coincide with fipronil application. Because the fipronil degradates are formed through abiotic or biotic degradation pathways in soil and water, the degradates were assumed to have a 100% application efficiency on the soil surface. This approach for estimating degradate concentrations is expected to be conservative.

Table 1: Fate Properties of Fipronil Degradates

Fate Parameter	MB 46136	MB 46513	MB 45950
Mean Koc	4208 mL/g	1290 mL/g	2719 mL/g
Aerobic Soil Metabolism Half-life	700 days	660 days	700 days
Aqueous Photolysis Half-life	7 days	Stable	Stable
Hydrolysis Half-life	Stable	Stable	Stable
Aquatic Metabolism Half-lives	1400 days	1320 days	1400 days
Water Solubility	0.16 mg/L	0.95 mg/L	0.1 mg/L
Application Rate* (kg a.i./ha)	0.013	0.024	0.003
References	**RP# 201555 ACD/EAS/Im/255 Theissen 10/97**	MRID 44262831 44262830 **Theissen 10/97**	**RP 201578 Theissen 10/97**

*The application rate was defined as a maximum percentage of degradate formation in any environmental fate study.

PRZM (3.12 version) and EXAM (2.97) were used for Tier II simulations. The Tier II assessment was conducted on a cotton site in Yazoo County, Mississippi (MLRA-131). The soil on the site is classified as a Loring silt loam (fine-silty, mixed, Thermic Typic Fragiudalf). Please see attached PRZM-EXAM assessment. The Tier II assessments were conducted on a soil with a very dense "hard pan" horizon commonly known as a fragipan. A fragipan can encourage lateral flow of water because of water impedance through the soil profile. The soil hydrology effects associated with the presence of a fragipan were not considered in the modeling. The metrology file used in the simulations were from MET 131. The weather data limited assessment to twenty years from 1964 to 1983. Simulations were conducted using EXAMS environment files for the farm pond (MSPOND.ENV) and a Mississippi index reservoir

(IRCOTN. ENV). Details regarding the index reservoir and the percent crop area (PCA) factor can be found at the following websites ((www.epa.gov/pesticides/scipoly)

Fipronil residue concentrations are presented as individual concentrations and as cumulative fipronil residues. The cumulative residue approach assumes that fipronil and its degradation products have equal toxicity profiles.

AQUATIC EXPOSURE ASSESSMENT

Tier II PRZM-EXAMS model simulation for aquatic environments indicates the 1 in 10 year daily peak and 21 day average concentration for fipronil is not likely to exceed 3.0 and 2.0 µg/L, respectively (Table 2). The 1 in 10 year annual average concentration is not likely to exceed 0.6 µg/L.

Table 2 Concentration of Fipronil Residues in the Farm Pond (µg fipronil /L)

Residue	Daily Peak	96 hour Average	21 day Average	60 day Average
Fipronil	2.9	2.6	1.7	1.4

Tier II PRZM-EXAMS modeling for individual fipronil degradates indicated that residue accumulated in the field pond environment. This accumulation can be attributed to the high potential persistence of fipronil degradation products in aquatic environments. The peak concentrations of fipronil degradates which steadily accumulated from one year and twenty years are presented in the table below.

Table 3 Concentration of Accumulated Fipronil Degradate Residues in the Farm Pond

Degradate Residue	1 Year Accumulated Peak (µg/L)	20 Year Accumulated Peak (µg/L)
MB 45950	0.7	2.0
MB 46136	2.9	7.1
MB 46513	5.5	21.8

Probabilistic assessment of the EECs is not possible because accumulation of residues indicate temporal dependence (correlation) between successive years. EFED notes, however, the Tier II assessment assumes long-term use of fipronil in an isolated farm pond watershed. This scenario is expected to be highly conservative because the "farm-pond" runoff scenario does not account for dilution or flow-through.

Surface Water Monitoring

Surface water monitoring data for fipronil has been conducted to assess impacts of fipronil use on rice to surface water quality. This monitoring was triggered because fipronil has been suspected of causing adverse effects on crayfish in Louisiana. Although rice cultural practices and site hydrology are different than cotton, these crops can be commonly grown in the same regions of the country (*e.g.*, Mississippi Embayment). Therefore, the monitoring data from rice culture uses of fipronil provide an indication of the pre-existing concentrations of fipronil in ambient surface waters in the southern Louisiana rice growing region.

Based on preliminary data from the Louisiana Department of Agriculture and Forestry from 23 monitoring sites in Calcasieu, Jefferson-Davis, Allen, Evangeline, Acadia, and Vermilion Parishes, the maximum concentration of fipronil residues was 8.41 ug/l for fipronil, 1.96 ug/L for MB46513, 0.50 ug/L for MB46136, and 0.32 ug/Lg for MB45950 from March 6, 2000 to May 15, 2000. The detections frequencies (number of detection/total number of samples) were 85% for fipronil, 32% for MB46513, 11.7% for MB46136, and 6.9% for MB45950. Because the monitoring data were derived from presentation materials, the level of detail is insufficient to assess data quality.

The registrant (Aventis) has submitted surface water monitoring data for the Mermentau River and Lake Arthur (MRID 453499-01). The Mermentau River drains a large portion of the rice acreage in southern Louisiana from the mouths of Bayou Plaquemine and Bayou Nezpique. It should be noted this area does not have any community water systems using surface source water. The monitoring program was designed to provide a snapshot of concentrations on May 11, 1999 from 0-to-1 feet and 4 to 6 feet depth. Low rainfall was observed (0.5 inches) from March 14 to May 9, 1999. Point samples were taken using a 1 L beaker for surface samples at depth of 1 feet and PVC tube sample at 5.5 feet depth Samples were taken from 14 sampling points from the north to south including the mouth of the Bayou Plaquemine, mouth of the Bayou Nezpique, 10,8,6,4,2,1 miles north of Lake Arthur Bridge; Lake Arthur Bridge, and 1,2,3,4, and 5 miles south of Lake Arthur Bridge. The reviewer notes that sample preparation (e.g. filtering) is not described in the submission; filtering is expected to reduce measured concentrations in whole water. Concentrations of Fipronil, MB46513, MB45950, and MB46136 in water were determined by LC/MS/MS method. The limit of detection (LOD) and limit of quantification (LOQ) were 0.004 ug/L and 0.010 ug/L, respectively. Recoveries from spiked water samples at 0.10 ug/L ranged from 86.4 to 105.4%.

The maximum concentration of fipronil residues at the mouth of the Bayou Plaquemine were 2.118 ug/L for fipronil in the 4 to 6 feet sample, 1.004 ug/L for MB46513 in the 0 to 1 feet sample, 0.269 ug/L for MB45950 in the 0 to 1 feet sample, and 0.270 ug/L for MB46136 in the 0 to 1 feet sample. The maximum total fipronil residue (summation of fipronil,MB46513, MB45950, and MB46136) concentration was 3.509 ug/L. There was a slight decrease in concentration downstream from the mouth of Plaquemine river to 5 miles south of Lake Arthur (18 miles downstream); concentrations were 1.027 ug/L for fipronil, 0.343 ug/L for MB46513, 0.034 ug/L for MB45950, and 0.130 ug/L for MB46136.

GROUND WATER ASSESSMENT

The environmental fate data for fipronil indicate a moderate to high persistence and relatively low mobility in terrestrial environments. Based on the SCI-GRO model, acute drinking water concentrations in shallow ground water on highly vulnerable sites are not likely to exceed 0.032 μg/L for parent fipronil, 0.012 μg/L for MB 46136, 0.016 μg/L for MB 46513, and 0.001 μg/L for MB 45950. Chronic concentrations are not expected to be higher than acute values.

V. Aquatic Exposure and Risk Assessment

Toxicity, Exposure and Risk, acute

Fish

Fipronil (technical) and MB46136 degradate are very highly or highly toxic to bluegill sunfish, rainbow trout and sheepshead minnow (estuarine). The metabolites RPA 104615 and MB46513 appear to be nearly non-toxic to fish. Aquatic exposure estimates using the more refined Tier II PRZM-EXAMS model simulation suggest acute risks from parent fipronil would be below all levels of concern (Appendix C, Table 10). However, acute risk and endangered species levels of concern would still be exceeded for the degradates MB 46136 and MB 46513 (Appendix C, Table 11).

Aquatic Invertebrates

There is sufficient information to characterize fipronil parent and its degradates MB46136 and MB45950 as very highly toxic to freshwater aquatic invertebrates. There appear to be great differences in the sensitivities between various taxa of freshwater species. A chironomid study demonstrates that some aquatic invertebrates may be over 440 times more sensitive than the routinely tested daphnid when exposed to parent fipronil. RPA 104615 appears to be nearly non-toxic to daphnids. In addition, the data from the marine invertebrate studies indicates that fipronil and its degradates are highly toxic to oysters and very highly toxic to mysids. Risk resulting from Tier II PRZM-EXAMS model based on the 1 year peak water concentration show acute risk quotients ranging from 0.33 for freshwater invertebrates to 145 for the mysid shrimp for the MB 46136degradate (Appendix C, Table11). If the 20 year peak water concentration is used the risk quotients will be considerably higher.

Sediment Dwelling Organisms

The results comparisons of acute toxicity testing with sediment-dwelling freshwater invertebrates with Tier II modelling results suggest that estimated pore water toxicity concentrations are considerably higher than the freshwater daphnid toxicity value (e.g., 29 ppb estimated concentrations versus a 0.41 ppb toxicity endpoint for the MB 46136 degradate). The resulting acute risk quotients range from 0.33 to 7 for the MB 45950 and the MB 46136 degradate, respectively (Appendix C, Table 11). Acute freshwater sediment toxicity testing on the parent and MB 46513 degradate have not been submitted. These tests as well as acute marine/estuarine sediment toxicity tests on fipronil and its degradates must also be submitted.

Aquatic Plants

Risk quotients have been demonstrated to be well below the acute and chronic levels of concern for aquatic plants. Therefore, no further testing or presumption of risk is noted.

Toxicity, Exposure and Risk, chronic

Fish

Fipronil affects larval growth (length) at concentrations greater than 6.6 μg/L, but less than 15 μg/L (the next highest concentration tested) in rainbow trout in the fish early life-stage test. However, in marine fish species the results are much more dramatic. Both length and weight are affected at concentrations greater than 0.24 μg/L, but not less than 0.41 μg/L (Appendix B, Table 7). The marine fish full life cycle test (Appendix B, Table 8) shows that growth effects (length) are demonstrated at test concentrations greater than 0.85 μg/L, but not less than 1.7μg/L. These results suggest that marine fish exhibit higher chronic sensitivity than freshwater fish. The chronic risks quotients resulting from the Tier II PRZMS-EXAMS exposure modeling from the one year peak water concentration range from 0.11 to 92 for the degradates, and all exceed the chronic LOCs with the exception of the MB 45950 degradate for freshwater fish (see Appendix C, Table 11). If the 20 year peak water concentrations are used LOCs will be exceeded by much greater margins (0.3 to 363). The only chronic risk quotient of concern from the parent fipronil is for marine fish (see Appendix C, Table 10).

Aquatic Invertebrates

The results from Appendix B, Table 11 indicate that the parent fipronil affects growth in daphnids at concentrations exceeding 9.8 μg/L (MRID 42918626). The results also indicate that fipronil affects reproduction, survival and growth of mysids at concentrations less than 0.005 μg/L (MRID 436812-01). It should be mentioned that both studies did not meet the guideline requirements, and because the results for these supplemental studies suggest that chronic toxicity is substantially below acute toxicity level, the test should be repeated for the parent fipronil to support full registration on cotton, corn, and rice. Additionally, considering the high variability in the sensitivity of freshwater species additional testing of traditionally more sensitive orders of freshwater aquatic invertebrates such as mayflies may assist in clearing up any uncertainties in freshwater chronic toxicity. Using the results of mysid chronic tests, the resulting chronic risk quotients exceed levels of concern for marine invertebrates by two orders of magnitude. The chronic freshwater invertebrate LOCs were exceeded by as much as two orders of magnitude when the ratio for the chronic to acute value for the daphnid studies are multiplied by the chironomid acute value (Appendix C, Table 10)

The freshwater daphnid studies suggest that chronic effects of the MB46136 degradate (NOEC = 0.63 μg/L) occur at considerably lower water concentrations than that of parent (NOEC = 9.8 μg/L). Again, due to the high variability of the sensitivity of freshwater species additional testing of more sensitive freshwater aquatic invertebrates orders such as mayflies may assist in clearing up any uncertainties in freshwater chronic toxicity. Marine invertebrate studies for the degradates MB 46136 and MB45950 show the same trends as the freshwater studies except that the toxicity is considerably greater (NOEC < 0.0026 μg/L). There is currently no chronic data on the MB 46513 degradate. The chronic LOCs are exceeded by more than three orders of magnitude for the MB 46136 degradate as well as the MB 46513 degradate if we assume the same toxicity of the parent. The MB 45950 degradate LOCs are exceeded by two orders of magnitude (Appendix C, Table 11).

Sediment Dwelling Organisms

No chronic data have been submitted to assess the chronic effects to sediment dwelling organisms. Due to the high aquatic chronic toxicity of this compound and its propensity to sorb to sediment chronic freshwater and marine sediment toxicity studies must be submitted for all degradates as well as the parent. However, an estimate of freshwater chronic sediment toxicity was determined by assuming that the chronic to acute ratio for daphnid studies would also apply to sediment dwelling chironomids. The resulting values obtained from this calculation suggest that chronic risk quotients range from 2.5 to 181 for chironomids.

Endangered Species Assessment

All endangered and threatened species are presumed to be at risk with the exception of the classes of organisms under the conditions or circumstances listed below. This presumption of risk is based on the endangered species LOC exceedance.

Birds

1. All birds foraging on seeds
2. 100 g birds foraging on broadleaf plants
3. 1000 g birds foraging on broadleaf plants and insects and tall grass when mean residue values are used.

Small Mammals

1. All weight classes of granivores
2. 1000 g herbivores and insectivores
3. Small mammals foraging in tall grass, broadleaf plants/insects, and seeds (chronic risk only)

Freshwater Fish

1. Parent fipronil
2. MB 45950 degradate

Marine Fish

1. Parent fipronil (acute risk only)

Freshwater Invertebrates

1. MB 46513 degradate
2. MB 45950 degradate

The Agency has developed a program (the "Endangered Species Protection Program") to identify pesticides whose use may cause adverse impacts on endangered and threatened species, and to implement mitigation measures that will eliminate the adverse impacts. At present, the program is being implemented on an interim basis as described in a Federal Register notice (54 FR 27984-28008, July 3, 1989), and is providing information to pesticide users to help them protect these species on a voluntary basis. As currently planned, the final program will call for label modifications referring to required limitations on pesticide uses, typically as depicted in county-specific bulletins or by other site-specific mechanisms as specified by state partners. A final program, which may be altered from the interim program, will be described in a future Federal Register notice. The Agency is not imposing label modifications at this time through this Section 3. Rather, any requirements for product use modifications will occur in the future under the Endangered Species Protection Program.

Aventis is a member of the FIFRA Endangered Species Task force. Any risk that cannot be mitigated should be addressed by providing endangered species locality information via the Task Force. Because the Task Force is not yet generating such information, Aventis should be encouraged to propose mitigation measures to protect endangered terrestrial and aquatic organisms.

Aquatic Risk Characterization

Use of Fipronil on cotton can be characterized as posing a great threat to aquatic species. Acute freshwater invertebrate risks from parent fipronil (RQ 6.8) and the MB46136 degradate (RQ 4.02) are above the EFED LOC. Chronic RQs for freshwater invertebrates are all above the chronic LOC for parent fipronil and the degradates. However, of most concern are the very high risk estimates for marine invertebrates. Acute RQs for estuarine/marine invertebrates range from 21 for parent fipronil to as much as 145 for the MB46136. Chronic risk quotients for marine invertebrates exceed LOCs by > 600 times for the parent to > 1100 times for the MB 46136 degradate for the one year degradate peak concentrations. Additionally, fipronil and all its degradates can be characterized as extremely persistent, and can be expected to accumulate during multiple year applications. The risk quotients are therefore considerably greater when the degradate 20 year peak concentration is used, because degradate accumulation is predicted in the static pond modeling scenario. Marine/estuarine aquatic systems adjacent to cotton fields are at great risk from the use of fipronil.

Fipronil in spray drift and in runoff to streams can be expected to reach the sediment and be biologically available to benthic and sediment dwelling organisms. Of the two degradates tested (MB 46136 and MB 45950) the acute sediment pore water toxicity value for MB 46136 is exceeded by the one year peak exposure concentrations in sediment pore water by a factor of 4.02. Although no chronic sediment toxicity values are available at this time, chronic risk can be expected to be quite high if it is assumed that the freshwater invertebrate acute/chronic ratio can be applied to the available chronic acute toxicity to derive estimates of chronic toxicity. When this assumption is used, the resulting chronic toxicity thresholds are exceeded by estimated pore water concentrations of MB 46136 and MB 45950 by factors of 181 and 2.5, respectively.

Acute and chronic risks to freshwater fish appear to be low based on the risk quotients for the parent fipronil (acute RQ 0.035, chronic RQ 0.44). However, the chronic risk quotient for marine fish (ranging from 6 to 12, depending upon estimate of EEC) exceed the EFED LOC by approximately one order of magnitude for marine fish. Concerns for chronic effects in fish are greater for the degradates. The chronic LOC for freshwater fish is exceeded for the MB 46136 and the MB46513 degradates (RQs 1.46 and 3.46, respectively) even if one year peak water concentrations are considered. The degradate RQ s are very high for marine fish (RQ 2.9 for MB 45950, 41 for MB46136, and 92 for MB 46513). In order to protect marine fish, great care must be taken to assure that fipronil does not reach marine/estuarine habitat.

Available toxicity data for freshwater invertebrates indicates considerable variation across species with respect to sensitivity to parent fipronil and its degradates. For example, daphnid and chironomid acute LC50 values for parent fipronil differ by a factor of more than 440X. Moreover, the chironomid data from the sediment toxicity studies with degradates are quite similar in sensitivity to the water only chironomid study with the parent compound. The apparent great difference in toxicity values from daphids to other freshwater invertebrates accounts for differences in interpretations of freshwater invertebrate risk assessments from earlier registrations (i.e., corn and rice uses). If the daphnid study is only considered in the acute risk quotient calculations, as was performed in earlier risk assessments, no acute LOCs are exceeded. However, the consideration of the more recently available chironomid data results in acute RQs ranging from 0.33 for the MB 45950 degradate to 12.8 for the MB 46513 degradate. Adjusted freshwater chronic toxicity values result in RQs ranging from 2.5 for the MB 45950 degradate to 181 for the MB 46513 degradate. The high degree of variation in the limited toxicity data sets for fipronil and the degradates has raised concern that the risk assessments may not adequately represent the scope of freshwater invertebrate sensitivity. To reduce the uncertainty associated with the risk to fresh water invertebrates additional acute and chronic testing for freshwater species such as mayflies, stoneflies, and caddis fly larvae should be conducted for the parent as well as the degradates.

Risk to aquatic plants are well below acute and chronic levels of concern. Therefore, no risk concerns are noted at this time.

Uncertainty: Although it is difficult to predict the effects of fipronil applications to the over-all health of an aquatic ecosystem over time or their ability to recover, there is minimal practical uncertainty for acute and chronic risk to individual classes of aquatic organisms. In addition, there is minimal uncertainty as to the toxicity and persistence of the degradates and their inherent tendency to accumulate in water and sediment.

As noted above, there appears to be a great difference in sensitivity between the daphnid and chironomid (more than 440X). The chironomid study from the sediment toxicity study shows a similar sensitivity to the water column chironomid study, and the great difference in toxicity values accounts for completely different interpretations in the risk assessment. This significant uncertainty requires additional freshwater invertebrate testing on sensitive freshwater larvae including mayflies, stoneflies, and caddis fly for both parent fipronil and degradates.

Acute and chronic toxicity tests for marine sediment-dwelling organisms and chronic tests for a freshwater sediment organisms are also required.

VI. Drinking Water Assessment

EFED believes the most appropriate PRZM-EXAMS Tier II screening modeling approach is to assume no PCA correction because the multiple registered uses of fipronil can coexist in the same geographic area. For example, rice, cotton, corn, in addition to urban uses can occur in parts of the Mississippi embayment area. However, the application of a PCA may be justified as a refinement with some consideration of limitations and uncertainties (Memorandum June 7, 2001 from Jim Hetrick to Arnold Layne).

PRZM-EXAMS (Corn-Cotton-Rice-Urban Uses)

Tier II PRZM-EXAMS modeling using the index reservoir indicates the 1 in 10 year daily peak (acute) and 90 day average (non-cancer chronic) drinking water concentrations for fipronil are not likely to exceed 7.1 and 3.0 μg/L, respectively (Table 4). The 1 in 10 year annual average concentration and 20 year annual average concentrations are not likely to exceed 1.0 and 0.4 μg/L, respectively. The concentration of combined fipronil residues are not expected to exceed 33.6 μg/L for the 1 in 10 year daily peak, 23.2 μg/L for the 1 in 10 year 90 day average, 11.7 μg/L for the 1 in 10 year annual average, and 6.2 μg/L 20 year annual average.

Table 4: The Estimated Concentration of Fipronil Residues in Drinking Water from the Index Reservoir (μg fipronil equivalents/L)

Residue	Daily Peak	90 day average	Annual Average	20 year Annual Average
Fipronil	**7.1**	**3.0**	**1.0**	**0.4**
MB 46513	**15.2**	**11.7**	**6.1**	**3.1**
MB 46136	**9.3**	**6.9**	**3.8**	**2.2**
MB 45950	**2.0**	**1.6**	**0.8**	**0.5**

Summed Residues[1]	**33.6**	**23.2**	**11.7**	**6.2**

1- Summed Residues- Summed concentration of fipronil and its degradation products. Summation assumes equivalent toxicity profiles among fipronil degradation products.

Uncertainties: There is uncertainty associated with application of the PCA. This uncertainty is associated with different registered uses of fipronil. Although OPP policy is to use the default PCA when there are no PCA's available for a specific crop, EFED believes the most appropriate screening approach is to assume no PCA because it accounts for the multiple registered crop uses fipronil and the urban/turf uses. Although available monitoring data for rice uses of fipronil are not representative of surface waters currently used as drinking water, it indicates maximum fipronil concentrations ranged from 2.118 to 8.41 ug/L. These concentrations are higher than the daily peak concentration predicted for the proposed use on cotton. However, the various uses of fipronil are expected to vary in potential fipronil loading into surface water. EFED believes the proposed cotton use is expected to have the greatest impact on fipronil residue loading into surface water used as drinking water because of the large geographical extent of the cotton production area coupled with the above ground use on cotton (foliar application). Because cotton uses can be captured in several PCA applications, the selection of a defensible PCA is difficult for refinement of the PRZM-EXAMS results.

Another uncertainty is the half-life of fipronil and its degradates in aerobic aquatic environments. The aerobic aquatic metabolism data (MRID 44261909) indicate that fipronil has a half-life of 14.5 days in aerobic aquatic environments. These data appear to contradict the persistence of fipronil ($t_{1/2}$=128 to 308 days) in aerobic soil metabolism studies. The registrant has submitted additional aerobic aquatic data showing registrant calculated first-order half-live for fipronil was 16 days for Ongar and 35.62 days for Manningtree sediment/water systems (RPA Document 201604). Based on the available aerobic aquatic metabolism data, the 90th percentile aerobic aquatic half-life for fipronil is 33.7 days. The drinking water assessment was conducted using the 90th percentile aerobic aquatic metabolism half-life. It's important to note that the aerobic aquatic metabolism studies were conducted under stratified redox conditions which lead to the formation of MB45950, a toxic degradation product. This compound was predominately associated with the sediment phase. Similar formation patterns were not observed in the aerobic soil metabolism studies (MRID 42928663). The PRZM-EXAMS modeling did not account for the conversion of fipronil to MB45950 in the index reservoir. This approach is not expected to alter the drinking water assessment because MB45950 partitioning in the reservoir was predominantly associated with the sediment phase rather than the dissolved phase.

Tier II modeling indicates the individual residues contribute substantially to the summed residue concentration of fipronil. Both MB 46513 and MB 46136 contribute to approximately two-thirds (68%) of the fipronil residues in drinking water. The concentration of MB 46513 is expected to be conservative because its application rate is base on a maximum degradate formation efficiency (43%) from a photodegradation in water study (MRID 42918661). Lower concentrations of MB 46513 have been detected in other environmental fate studies. MB 45950 had low concentrations in all environmental fate studies except for the aquatic metabolism studies. The highest conversion efficiency of MB45950 was not considered because it is associated with anoxic (anaerobic) environments, a condition not expected in the index reservoir. Therefore, the summation of degradation products is expected to be conservative because the maximum degradate conversion efficiency was assumed to occur under the same environmental conditions.

VII. Terrestrial Exposure and Risk Assessment

Toxicity, Exposure and Risk, acute and chronic

Birds and mammals

Numerous bird and mammal species forage in cotton fields and occupy the surrounding habitat and hedgerows. The environmental concentrations resulting from the use of fipronil and its degradates is expected to be significant. In addition, due to the persistence of fipronil and its degradates, residues can be expected to accumulate in the foliage and soil.

A number of avian studies have been submitted which included northern bobwhite, mallard duck, pigeon, red-legged partridge, and house sparrow. The details of these studies are presented in Appendix B. The EFED has found that the LD_{50} value is often a better indicator of acute toxicity to birds for acutely toxic pesticides. This is especially true when the LD_{50} is less than or equal to 50 mg/kg.

When the LD_{50} is used, an estimate of the amount of pesticide that birds are likely to ingest in a single day is calculated and used in risk quotient calculations. Since the fipronil parent most sensitive LD_{50} of 11.3 mg/kg is less than 50 mg/kg, risk quotient calculations were calculated using this method. However, it should be noted that these risk quotient calculations did not account for accumulations of fipronil and it's persistent degradates. These residues can add a cumulative effect over time as applications are repeated.

The resulting risk quotient LOCs are exceeded in either acute risk, acute restricted use risk, or endangered species for all food items except seeds for both predicted and mean residues. These exceedences included scenarios for a single application of 0.05 lb ai/A or for up to four applications at the same rate.

In addition to highly toxic LD_{50} value of 11.3 mg/kg for the parent fipronil, the MB 46513 degradate has been demonstrated to have an even more highly toxic LD_{50} value of 5 mg/kg. The acute risk quotient LOCs for the MB 46513 degradate are exceeded in either acute risk, acute restricted use risk, or endangered species for all food items except seeds for both predicted and mean residues. These LOC exceedances are significantly greater than the parent fipronil. The highest risk quotient is 9 for a twenty gram bird.

Although the LD_{50} of 11.3 mg/kg is less than 50 mg/kg for the parent fipronil, for the sake of comparison, the EFED calculated the risk quotients using the bobwhite quail dietary LC_{50} of 48 mg/kg-diet. The resulting risk quotients for a single application showed risks only for restricted use and endangered species LOCs.

Chronic risk quotients calculated on the basis of the average residues on food items for fipronil being applied four times at a rate of 0.05 lb ai/A resulted in LOC exceedences only for birds foraging in short grass.

Although not requested by EFED, the registrant submitted an avian field study (MRID # 451359-01) which measured actual field concentrations of fipronil and its metabolites on various avian food sources under conditions which more closely represent actual field applications to cotton fields. The application rate of 0.075 lb ai/A was higher than the proposed label rate of 0.05 lb ai/A. The application intervals was 7 to 10 days with a maximum 4 applications per year. The study concluded that resulting risk quotients ranged from <0.01 to 0.09 using the lowest dietary LC_{50} value. and that a 135 g bird would have to consume about 180% of its body weight as one dose to achieve an LD_{50}. Based on the data summarized in the review, EFED agrees with the study authors conclusions that there is very low risk to birds. However, there is no EPA approved guidance or protocol for performing or reviewing a residue study on avian food items, and the EFED is limited to the extent that it can use the results in a risk assessment. Although the study was conducted in a scientifically sound manner, the impact of collection of samples on days which rain occurred was not discussed. The study authors made no mention if any of the residue concentrations could have been washed off during the collections. This issue should have been addressed in the study. It should also be noted that the actual residue values of 6.35 ppm for millet are considerably higher than the maximum and typical predicted Kenaga/Fletcher values of 1.125 and 0.525 ppm respectively. This is significant in that it shows that these predictive models may not be as conservative as previously thought.

Conversely, the residue values for the other food items are much lower than the Kenaga/Fletcher values. EFED is therefore, skeptical about overriding the concerns expressed in the risk quotient calculations presented above. Due to the results of this study as well as the registrant's proposal to reduce the maximum label rate to 0.05 lb ai/A per application not to exceed 0.2 lb ai/A per year, the EFED's concern for avian exposure and risk is reduced, however, there still remains an uncertainty concerning the risk of fipronil to birds when applied as a broadcast application on cotton as well as accumulation which might occur as a result of multiple applications.

The only acute risk quotient LOCs which are exceeded for small mammals are mammalian restricted use, and endangered species LOCs for 15 and 35 g herbivores/Insectivores at registered maximum application rates. The mammalian chronic level of concern is exceeded at registered maximum application rates only for small mammals foraging in short grass. These exceedences are comparably much lower than the bird risks and can be mitigated much more easily.

Terrestrial Plants

Terrestrial plant testing is not required for pesticides other than herbicides except on a case-by-case basis (*e.g.*, labeling bears phytotoxicity warnings incident data or literature that demonstrate phytotoxicity). A literature search conducted by EFED revealed that continuous seed exposure to fipronil (four days) at 2000 mg/L significantly impaired seed germination in rice. However, fipronil is currently registered for seed treatment on rice at a rate of 0.05 lb ai/A. When converted, this application rate is equivalent to 22680 mg ai/A. This acreage can be converted to 5.6 mg ai/m^2. In order to convert the area covered in a square meter to a volume equivalent one could make the assumption that a 0.108 m water depth occupying a square meter would yield the volume equivalent of 1000 cm^3 or 1 Liter. The final concentration occupying this hypothetical 1 Liter volume would be 0.52 mg ai/L. This concentration is well below the 2000 mg/L seed germination impairment endpoint. Therefore, EFED will not ask for terrestrial plant data at this time, and a terrestrial plant risk assessment or characterization can not be done at this time.

Appendix A: Environmental Fate Data

DEGRADATION

Hydrolysis (161-1)
MRID No. 42194701

Radiolabelled fipronil was stable (<3% degraded by day 30 post-treatment) in pH 5 and pH 7 buffered solutions and hydrolyzed slowly ($t_{1/2}$=28 days) in pH 9 buffer solutions. The major degradate of fipronil was RPA 200766. In pH 9 buffer solution, RPA 200766 reached a maximum concentration of 51.7% of applied radioactivity at 30 days post-treatment. These data suggest that abiotic hydrolysis of fipronil is an alkaline-catalyzed degradation process.

The study (MRID 42194701) fulfills the hydrolysis (161-1) data requirement for fipronil. No additional data are needed at this time.

Photodegradation in water (161-2)
MRID No. 42918661
Ref.#ID: ACD/EAS/Im/255 (Interim Study)

Radiolabelled fipronil had a half-life of 3.63 hours in pH 5 buffer solution when irradiated with Xenon light. There was no fipronil degradation in the dark controls. Two degradates, MB46513 and RPA 104615, were identified in irradiated test samples. MB 46513 reached a maximum concentration of ≈43% of applied radioactivity at 6 hours postexposure. RPA 104615 reached a maximum concentration of ≈8% of applied radioactivity. One unidentified degradate, characterized as with a molecular weight of 410 a.m.u., reached a maximum concentration of ≈5.5% of applied radioactivity. Radioactive volatiles were not detected (<0.04% of applied radioactivity) in ethylene glycol and NaOH gas traps.

The study (MRID 42918661) fulfills the photodegradation in water data requirement (161-2). No additional data are needed at this time.

Photodegradation on soil (161-3)
MRID No. 42918662

Radiolabelled fipronil had a half-life of 34 days (dark control corrected half-life = 110 days) on loam soil when exposed to intermittent (8 hour photodegradation period) Xenon light. Radiolabelled fipronil had a half-life of 49 days in dark controls. Photodegradates were RPA 200766 (11% of applied), MB 46136 (4% of applied), MB 45590 (1.91% of applied), MB 46513 and RPA 104615 (each at 8% of applied). Organic volatiles were not detected (<0.5% of applied) in the gas traps from irradiated or dark control samples. However, carbon dioxide evolution was detected (2.5% of applied) from irradiated samples.

The study (MRID 42918662) fulfills the photodegradation on soil data requirement (161-3) for fipronil. No additional data are needed at this time.

METABOLISM

Aerobic soil metabolism
MRID No. 42928663
MRID No. 44262830

Radiolabelled fipronil, applied at 0.2 μg/g, had half-lives ranging from 128 to 308 days in sandy loam and sand soils when incubated aerobically in the dark at 25°C. Major degradates of fipronil were identified as RPA 200766 (27 to 38% of applied) and MB 46136 (14-24% of applied). Minor degradates of fipronil were identified as MB 45950 (< 5%), MB 46513 (1% of applied), and MB 45897 (<1% of applied). Additionally, six unidentified degradates were detected (each < 4% of applied radioactivity). No discernable decline patterns were observed for the fipronil degradates during the testing period. Unextractable radioactivity accounted for 6 to 15% of the applied radioactive fipronil. Radioactive volatiles (organic + CO_2) did not account for a discernible amount of applied radioactivity.

Radiolabelled MB 46513, applied at 0.1 μg/g, had an extrapolated half-life of 630 and 693 days in loamy sand soils when incubated aerobically in the dark at 25°C. Major metabolites were RPA 105048 (5-amino-3-carbamoyl-1-(2,6-dichloro-4-trifluoromethylphenyl)-4-trifluoromethylsulfonyl pyrazone). RPA 105048 reached a reported maximum concentration of 0.014 ppm and 0.017 (14% and 17% of applied, respectively). In addition, an unidentified degradate was detected at a maximum concentration of 0.003 ppm or 3% of applied radioactivity. Radiolabelled volatiles (organic + CO_2) were also detected (≤2% of applied radioactivity).

The registrant submitted aerobic soil metabolism data for MB 46513. Since no aerobic soil metabolism data are available for the other fipronil degradates, it is assumed the fipronil degradates are persistent ($t_{1/2}$=700 days; stable) in terrestrial environments.

The study (MRID 42928663) in conjunction with the degradate metabolism study (MRID 44262830) fulfills the aerobic soil metabolism (162-1) data requirement for parent fipronil and MB46513. No additional data are needed at this time. EFED notes the registrant assumes that fipronil degradates MB45950 and MB46136 are persistent in terrestrial environments. Further refinement of the comprehensive fate and exposure assessment for fipronil would require additional data on aerobic soil metabolism of MB45950 and MB46136.

Anaerobic Aquatic Metabolism (162-3)
MRID No. 43291704

Radiolabelled fipronil, applied at 0.75 ppm in water or 1.5 ppm in soil, had half-lives of 116-130 days in anaerobic pond water/sediment when incubated under N_2 in the dark. Major degradates of fipronil were MB 45950 (47% of applied) and RPA 200766 (18% of applied). MB 45950 was predominantly detected in the soil extracts. In contrast, RPA 200766 was detected in both water and soil extracts. Numerous minor degradates (≤6% of the applied radioactivity) were detected in soil and water extracts. Unextractable radioactivity accounted for ≈18% of the applied radioactive fipronil.

The study (MRID No. 43291704) fulfills the anaerobic aquatic metabolism (162-3) and anaerobic soil (162-2) data requirement for fipronil. No additional data are needed at this time.

Aerobic Aquatic Metabolism (162-4)
MRID No. 44261909, 44262826

Radiolabelled fipronil, applied at 0.05 ppm (w/w), rapidly degraded ($t_{1/2}$≈14.5 days) in sandy loam soil when incubated under stratified redox conditions in the dark at 25°C. Parent fipronil had a maximum concentration of 0.0497 ppm (0.05 ppm application rate) at time 0 (immediately post-treatment), 0.0009 ppm at 90 days posttreatment, and < 0.0003 ppm at 365 days post-treatment. Major metabolites of fipronil were MB 45950 (82.58% of applied at 365 days post-treatment) and RPA 200766 (11.09% of applied at 60 days). Minor metabolites were RPA 105048 (7.73% of applied) and MB 46513 (0.33% of applied). Two unidentified metabolites had maximum concentrations ranging from 3.34 to

4.58% Organic volatiles had a maximum cumulative concentration of 0.0005 ppm. Radioactive CO_2 had a maximum cumulative concentration of 0.001 ppm (% of applied).

Radiolabelled fipronil had half-lives of 16 and 35 days in stratified whole system water/sediment from United Kingdom. Fipronil disappearance from the water column was associated with the formation of MB45950 on sediment. The maximum concentration of MB45950 was 80% of applied radioactivity at 121 days post-treatment. Minor degradation products(<10% of applied) were RPA 200766 and MB46126.

The aerobic aquatic metabolism (162-4) data requirement is fulfilled. The study (MRID 44261909) in conjunction with the aerobic aquatic metabolism study (MRID 44661301) provide marginally acceptable data on the aerobic aquatic metabolism of fipronil. The data are deemed as marginally acceptable because the aerobic aquatic metabolism studies were conducted in stratified redox conditions which confounds interpretations on aerobic metabolism processes in aquatic environments. All the available data indicate fipronil degradation is dominated by anaerobic metabolism in the sediment as evident by the formation of MB45950. The main uncertainty is the persistence of fipronil in slightly acid (pH 5.5 to 7.0), oxic sediments. No additional data are needed at the time.

MOBILITY

Leaching mobility study (163-1)
MRID No. 42918664
MRID No. 43018801 and 44039003

Radiolabelled fipronil had Freundlich coefficients of 4.19 mL/g (1/n=0.947; K_{oc}= 1248) for sand loam soil, 9.32 mL/g (1/n=0.969; K_{oc}= 800) sandy clay loam soil, 10.73 mL/g (1/n=0.949; K_{oc}=673) for Speyer 2.2 soil, 14.32 mL/g (1/n=0.947; K_{oc}=427) for sandy clay loam soil, and 20.69 mL/g (1/n= 0.969; Koc=486) for loam soil. Desorption coefficients for fipronil ranged from 7.25 to 21.51 mL/g. Fipronil sorption appears to be lower (K_f< 5 mL/g) on coarse-textured soils with low organic matter contents. These data suggest that fipronil sorption on soil is not a completely reversible process. Since the fipronil sorption affinity correlates (r= 0.97) with soil organic matter content, fipronil mobility may be adequately described using a K_{oc} partitioning model. Soil column leaching studies confirm the potential immobility of fipronil.

Radiolabelled fipronil was relatively immobile (>80% of the applied radioactivity in the 0-to-8 cm segment) in soil columns for five different foreign soils including a German loamy soil, Manningtree UK loamy sand (called sandy loam in study), Manningtree UK loam, French sandy clay loam (1), and French sandy clay loam (2). In the Manningtree UK loamy-sand soil, however, radiolabelled fipronil residues were detected in the 0-14 cm segment. Radioactive fipronil residues (1-8% of applied) were detected in leachate samples from all test soils. Leachate residues were not identified.

Radiolabelled MB 46513 had Freundlich adsorption coefficients of 4.3 mL/g (K_{oc}=1150 mL/g) for sand soil, 5.1 mL/g (K_{oc}= 1498 mL/g) for loamy sand soil, 5.5 mL/g (K_{oc}=1164 mL/g) for silt loam soil, 15.2 mL/g (K_{oc}=1245 mL/g) for clay, and 69.3 mL/g for pond sediment (K_{oc}=1392). Initial desorption coefficients of MB46513 are 5.8, 5.9, 6.2, 14.7, and 66.2 mL/g for sand, loamy sand, silt loam, clay, and pond sediment, respectively. All soils and sediment showed increasing K_{des} values (cycle 2 K_{des} values ranged from 6.9 to 73.6 mL/g and cycle 3 K_{des} values ranged from 9.5 to 85.9 mL/g) for successive desorption cycles. These data suggest that MB 45950 sorption on soil is not a completely reversible process.

The degradates MB 45950 and MB 46136 have a moderate to high sorption affinity to organic carbon. Interim data indicate MB46136 had K_{oc} adsorption coefficients of 5310 mL/g in a silt loam soil, 4054 mL/g in a sandy loam soil, 6745 mL/g in a loam soil, 3486 mL/g in a sandy clay loam soil, and 1448 mL/g in silt loam soil. MB 45950 had K_{oc} adsorption coefficients of 2404 mL/g in a silt loam soil, 3120 mL/g in a sandy loam soil, 2925 mL/g in a loam soil, 3521 mL/g in a sandy clay loam soil, and 1619 mL/g in silt loam soil.

Aged soil column leaching studies demonstrated immobility of RPA 200766, MB 45950, MB 46136 and RPA 104615. RPA 200766 was detected (2-17% of applied) in all soil columns except the Manningtree sandy loam. Detections of MB 45950 and MB 46136 were more sporadic in soil columns. Radioactive residues were detected (< 1 to 4% of applied radioactivity) in leachate samples. Leachate residues were not identified.

The unaged residue mobility studies (MRID No.43018801 and 42918664) fulfill the batch equilibrium/adsorption-desorption data (163-1) requirement for fipronil. The aged residues mobility studies (MRID No. 43018801 and 42918664) in conjunction with batch equilibrium studies on MB 46513 (MRID 44262831), MB

46136 and MB 45950 (Theissen, 10/97) should fulfill the aged portion of the 163-1 data requirement. EFED notes the batch equilibrium data for MB 46136 and MB 45950 were taken from interim reports. Complete study submissions for the interim reports are needed to confirm the validity of the batch equilibrium data.

DISSIPATION

Terrestrial field dissipation (164-1):
MRID No. 43291705, 43401103, 44298001

Fipronil, applied as REGENT 1.5G at an in furrow rate of 0.13 lbs a.i./A, had dissipation half-lives ranging from 3.4 to 7.3 months in a loam soil in San Juan Bautista, CA, a clay loam soil in York, NE, a sand soil in Clayton, NC, and a loamy sand soil in Ephrata, WA. Degradation products of fipronil detected in field soils were MB 46136, MB 45950, and RPA 200766. Fipronil residues were detected predominately in the top 0 to 15 cm soil depth at all test sites. However, there was detection of fipronil, MB 45950, MB 46136 and RPA 200766 at a depth of 15 to 45 cm for in-furrow treatments on coarse sandy loam soil in Ephrata, Washington. Although the field dissipation half-life of individual residues was not reported, the half-live of combined fipronil residues (including fipronil, MB 46136, MB 46513, MB 45950, and RPA 200766) ranged from 9 to 16 months.

Fipronil, applied at a rate of 0.05 lbs a.i/A, had dissipation half-lives of 1.1 months for bare ground on sand soil in Florida, 0.4 months for turf on a sand soil in Florida , 1.5 months for bare ground on loamy sand soil in North Carolina, and 0.5 months for turf on sandy loam soil in North Carolina. MB 46136 and RPA 200766 were detected (>2 µg/kg) in field soil samples. MB 46136 had a maximum concentration ranging from 5.6 to 8.9 µg/kg at 2-3 months post treatment. RPA 200766 was detected in bare ground samples at a maximum concentration of 3.7 µg/kg at 3 months post-treatment. Despite excess rainfall/irrigation levels, the fipronil residues remained in the upper 6 inch soil layer at each location during the 4 month testing period. Although the field dissipation half-life of individual residues was not reported, the half-live of combined fipronil residues (including fipronil, MB 46136, MB 46513, MB 45950, and RPA 200766) ranged from 2.5 to 5.33 months. EFED notes there was generally a poor fit (R^2=0.3 to 0.7) of the first-order degradation model to describe combined fipronil residue dissipation.

Fipronil, foliar applied as 80 WG at a rate of 0.3 lbs ai/A, had half-lives ranging from 132 to 159 days on a California cotton site, 14 to 31 days on Texas cotton site, and 193 days on Washington potato site. Fipronil residues (fipronil, MB45950, MB46136, MB46513, and RPA200766) had half-lives of 478 days for the California site, 134 days for the Texas site, and 745 days for the Washington site. Because the registrant did not provide a site water balance (total precipitation & rainfall minus pan evaporation), a leaching assessment cannot be made at this time. However, the field dissipation data indicate fipronil residues did not appear to leach below the 0.3 m soil layer. The detection of MB46136 and MB46513 indicate that photodegradation and microbial-mediated degradation are probable routes of field dissipation for foliar-applied fipronil.

The field dissipation studies (MRID 43291705 and 43401103) in conjunction with the registrant's rebuttal (MRID 44298001) provide an understanding of field dissipation of fipronil and its degradation products for in-furrow and turf uses. The field dissipation study (MRID 44262826) for cotton is deemed as supplemental because a field water balance could not be estimated. EFED is requesting pan evaporation data to assess the leaching potential for each site. Upon receipt and review of the pan evaporation data, the data will be reviewed for the leaching potential.

ACCUMULATION

Fish Accumulation (165-4):
MRID No. 43291706, 43291707, 44298002

The bioconcentration factor (BCF) of radiolabelled fipronil, applied at a constant concentration of ≈900 ng equiv.L^{-1}, in bluegill sunfish was 321X in whole fish, 164X in edible tissue, and 575X in non-edible tissues. Major fipronil residues in fish tissues were identified as MB 46136, MB 45897, and MB 45950. In edible fish tissues, the maximum residue concentration was 55% of accumulated for MB 46136, 14% of accumulated for MB 45897, and 9% of accumulated for MB 45950. In inedible fish tissues, the maximum residue concentration was 59% of accumulated for MB 46136, 23% of accumulated for MB 45897, and 9% of accumulated for MB 45950. In whole fish tissues, the maximum residue concentration was 28% of accumulated for MB 46136, 24% of accumulated for MB 45897, and 9% of accumulated for MB 45950. RPA 200766 was as a minor degradate in fish tissues. Accumulated fipronil residues were eliminated (>96%) after a 14 day depuration period.

The studies MRID 43291706 and 43291707 in conjunction with rebuttal comments, MRID 44298002, satisfy the bioaccumulation in fish (165-4) data requirement. No additional data are needed at this time.

Appendix B : Ecological Toxicity Data

Toxicity to Terrestrial Animals

i. Birds, Acute and Subacute

The acute oral toxicity data for birds exposed to fipronil is summarized in Table 1 below. The oral toxicity to fipronil is extremely variable among species tested. Fipronil is very highly toxic to bobwhite quail, partridge, and pheasant, yet nearly non-toxic to the pigeon, house sparrow, and mallard duck. The degradate MB 46513 is 2 times more orally toxic to bobwhite quail than the parent compound and was 4 times more orally toxic to the mallard duck.

Table 1. Avian Acute Oral Toxicity Findings

Species	% A.I.	LD_{50} (CLs) (mg/kg-bw)	NOEC (mg/kg-bw)	MRID No. Author/Year	Classification
Northern bobwhite	96	11.3* (9-14)	< 4	429186-17 Pedersen (1990)	Core
Mallard duck	96.8	>2150	2150	429186-16 Pedersen(1990)	Core
Pigeon	97.7	>500	N.R.	429186-13, Hakin and Rodgers(1991)	Supplemental
Red-legged partridge	95.4	34 (28-42)	16	429186-14 Hakin and Rodgers(1992)	Supplemental
Pheasant	95.4	31 (22-44)	5	429186-15 Hakin and Rodgers(1992)	Supplemental
House sparrow	96.7	1000 (742-1691)	<464	429186-18 Pedersen and Helsten(1991)	Supplemental
Northern bobwhite	99.7 MB46513	5 (2.4-12)	3.16	437766-01 Pedersen and Solatycki(1993)	Supplemental
Mallard duck	98.6 MB46513	420 (298-581)	147	437766-02 Helsten and Solatycki(1994)	Supplemental

Species	% A.I.	LD_{50} (CLs) (mg/kg-bw)	NOEC (mg/kg-bw)	MRID No. Author/Year	Classification
Northern bobwhite	1.6 WG	1065 (700-1400	175	429186-19 Pedersen and DuCharme(1993)	Supplemental

* 30% mortality at 10 mg/kg-bw and 0% mortality at 4.6 mg/kg-bw.
NOEL=1 mg/Kg

Table 2 summarizes the available avian subacute dietary toxicity data. Fipronil is very highly toxic to bobwhite quail on a subacute dietary basis, yet is practically non-toxic to mallard duck on a subacute basis. The dietary toxicity assessment is based on less extensive data set than the acute oral toxicity assessment. Therefore, it is not certain whether the wide species sensitivity seen in oral testing would also be displayed in dietary studies. The reviewer assumes that this is a possibility that must be considered in assessing potential risk. In addition, there are dietary toxicity data for the fipronil degradate MB46513. The dietary toxicity of 119.2 mg/Kg-diet for the degradate is somewhat lower than that of fipronil as indicated.

Table 2. Avian Subacute Dietary Toxicity Findings

Species	% A.I.	LC_{50}(CLs) (mg/kg-diet)	NOEC (mg/kg-diet)	MRID No. Author/Year	Classification
Northern bobwhite	95% Tech.	48.0 (38-59)*	19.5	429186-20 Pedersen(1993)	Core
Mallard duck	95% Tech.	>5000(N.A.)	1250	429186-21 Pedersen(1993)	Core
Northern Bobwhite	97.8 MB54513	119.2	18.6	492592-01 Gallagher, et. al. (2000)	Core
Northern bobwhite	97.8 MB54513	<178	-	449207-01	Supplemental
Northern bobwhite	97.7 MB46136	84	–	448903-01	Core
Northern bobwhite	97.8 MB45950	114	-	448903-02	Core

* 20% mortality at 35 ppm and 0% mortality at 16 ppm(NOEL).

ii. Birds, Chronic

The avian reproductive studies (Table 3) indicate that fipronil had no effects at the highest levels that were tested in mallard (NOEC=1000 mg/kg-diet) and bobwhite quail (10 mg/kg-diet). The bobwhite NOEC of 10 ppm, which was the highest level tested, will be used as the chronic effects regulatory endpoint pending further studies for terrestrial avian species.

Table 3. Avian Reproductive Toxicity Findings

Species	% A.I.	NOEC (mg/kg-diet)	LOEC (mg/kg-diet)	Endpoint Affected	MRID No. Author/Year	Classification
Northern bobwhite	96.7 Tech.	10	Not Determined	None	429186-22 Pedersen and DuCharme(1993)	Supplemental
Mallard duck	96.7 Tech.	1000	>1000	None	429186-23 Pedersen and Lesar (1993)	Core

The guideline (71-4) is partially fulfilled (MRID 429186-23). The northern bobwhite quail study (MRID 429186-22) does not fulfill guideline requirements, and the need for a new study is apparent unless the present proposed use will not produce terrestrial EECs above 10 mg/kg-diet.

iii. Mammals, Acute and Chronic

Wild mammal testing is required on a case-by-case basis, depending on the results of the lower tier studies such as acute and subacute testing, intended use pattern, and pertinent environmental fate characteristics. In most cases, however, an acute oral LD_{50} from the Agency's Health Effects Division (HED) is used to determine toxicity to mammals (HED Tox One-liners). These $LD_{50's}$ are reported in Table 4. The available mammalian data indicate that fipronil (Technical) is moderately toxic to small mammals on an acute oral basis. The 1.6% in EXP60655A and 0.25% in RM1601C formulations of fipronil did not demonstrate significant mammalian dietary toxicity.

Table 4. Mammalian Acute Oral Toxicity Findings

Species	% AI	LD_{50} (mg/kg-bw)	MRID	Category
Rat (small mammal)	93%	97	429186-28	Mod. Toxic
Rat (small mammal)	MB46136 degr.(98%)	218	429186-75	Mod. Toxic
Rat (small mammal)	1.6(form.) EXP60655A	>5000	429186-36	P.Non-Toxic
Rat (small mammal)	0.25(form.) RM1601c	>5000	431211-04	P.Non-Toxic

Fipronil and desulfinyl fipronil (MB46513) were evaluated for persistence and metabolism in male Swiss-Webster mice as well as comparative acute toxicity (intraperitoneal administration) and affinity for the mouse GABA receptor (Hainzl and Casida, 1996). Groups of mice received five daily 1 mg/kg doses of fipronil or MB46513, i.p. Mice were sacrificed at day 6 and day 27 and adipose tissue was analyzed for fipronil and degradates. Adipose tissue of fipronil treated mice contained only the sulfone metabolite of fipronil (MB46136). MB46513 treated mice contained only this photodegradate in adipose tissue, suggesting no metabolism of the compound. Adipose concentrations of MB46136 and MB46513 were at a maximum at day 6 (22-24 mg/kg fat) but by day 27 these concentrations had been reduced to 0.8 to 3.2 mg/kg. The neurotoxic potency of fipronil was maintained or possibly increased upon the formation of desulfinyl derivatives of fipronil. The acute i.p. LD_{50} for fipronil in mice was 41 mg/kg, while the LD50 for MB46513 was 23 mg/kg, suggesting the potential for comparable toxicity between fipronil and the photodegradate in mammalian systems. It is noteworthy that MB46513 exhibits a greater affinity for the mouse GABA receptor (IC_{50} 94 nM) than parent fipronil (IC_{50} 1010 nM). The toxicity data and GABA receptor data suggest that risk assessments for uses of fipronil where the photodegradate can be expected to be produced should assess the potential toxicological implications of this degradate.

A number of toxicological studies involving subchronic and chronic exposure of mice, rats, and dogs to fipronil are available. These studies address a variety of toxicological endpoints including neurological function, thyroid function, carcinogenicity, histology, reproductive effects, and developmental effects. EFED has concentrated the toxicological evaluation of effects on mammalian systems to those effect endpoints expected to be of the highest ecological relevance. Concern for wild mammal population maintenance focused this evaluation on effects to individual fecundity and survivability of offspring. Therefore, EFED has concentrated on reproductive and developmental endpoints. A multi-generation reproduction study in CD rats (MRID 429186-47) is the source of reproductive toxicity data for this assessment. Thirty-six CD rats/sex/group received fipronil continuously in the diet at concentrations of 0, 3, 30, and 300 mg/kg diet. This study reported decreased litter size in F_1 and F_2 litters and a decrease in the percentage of F_1 parental animals mating at the maximum dose tested 300 mg/kg-diet. In addition, this high dose produced reduced post-implantation and postnatal survivals in F_2 litters. The NOEL for these effects is 30 mg/kg-diet (HED equivalence to 2.54 mg/kg-bw males, 2.74 mg/kg-bw females) and the LOEL is 300 mg/kg-diet (HED equivalence to 26.03 mg/kg-bw males, 28.4 mg/kg-bw females).

iv. Insects

Interim data (Table 5) suggest that fipronil is extremely toxic to honeybees via direct contact or oral ingestion of fipronil residues. The Agency has not reviewed data regarding the acute or foliar contact toxicity of fipronil to honeybees or other non-target beneficial insects. The study will be needed to support foliar ground spray and aerial application of fipronil.

Label warnings do advise that fipronil is highly toxic to honeybees so it is assumed that studies have been conducted but not submitted to the Agency. Interim toxicity endpoints are listed in the table below.

Table 5. Toxicity to Nontarget Beneficial Insects

Species	Study Type	Toxicity (μg ai/bee)	MRID Study Date	Category
Apis mellifera	Acute contact	LD50: 0.00593	N/A	Unverified
Apis mellifera	Acute oral	LD50: 0.00417	N/A	Unverified
Apis mellifera	Foliar contact	No data	No data	

Aquatic Organism Toxicity

Table 6 summarizes the freshwater and marine fish data reviewed to date using fipronil technical and fipronil degradates which are expected to persist in the aquatic environment. Two freshwater fish toxicity studies (with one study using a coldwater species (preferably the rainbow trout) and the other a warmwater species (preferably the bluegill sunfish) are required. A fish study with the sheepshead minnow is required for marine/estuarine fish.

Table 6. Freshwater and Marine Fish Acute Toxicity Findings

Species	% A.I.	LC_{50} (CLs) (µg/L)	NOEC (µg/L)	MRID No.	Classification
Freshwater Species					
Bluegill sunfish	100 Tech.	83(72-98)	43	429186-24	Core
Rainbow trout	100 Tech.	246(205-342)	34	429779-02	Core
Channel catfish	97 Tech.	560	-	44299-01	Core
*Rainbow trout	99.2-deg. (MB46136)	39(34-43)	18	429186-73	Supplemental
*Bluegill sunfish	99.2 deg. (MB46136)	25(21-30)	6.7	429189674	Supplemental
*Raimbow trout	100 deg (MB46513)	>100,000	36,000-	432797-03	Core
*Raimbow trout	94.7 deg (MB46513)	>100,000	-	432917-18	Core
*Bluegill sunfrish	(MB46513)	20	-	157298	Supplementsal
*Rainbow trout	94.7 photo-degr. (RPA104615)	>100,000	NA	432917-18	Supplemental
Marine/Estuarine Species					
Sheepshead minnow	96.1 Tech.	130(110-280)	<110	43291702	Core

* Studies used aerobic metabolic degradates/metabolites of Fipronil.

The results of the 96-hour acute toxicity studies (Table 6) indicate that fipronil (Technical) and MB46136 degradates are very highly or highly toxic to bluegill sunfish, rainbow trout and sheepshead minnow (estuarine). The metabolites RPA 104615 and MB46513 appear to be nearly non-toxic to fish. The guidelines for freshwater fish are fulfilled. Additional acute studies for marine/estuarine degradates should be performed to reduce uncertainties about the toxicity of marine fish because the toxicity values of the degradates for freshwater fish are consistently greater than the parent fipronil. In addition, chronic values for marine fish have demonstrated low NOEC concentrations and significant LOC exceedances for the parent fipronil.

Data from fish early life-stage tests (Table 7) were required for fipronil due to the high acute toxicity of the parent, persistence characteristics, and the probability fipronil will enter bodies of water from the proposed use on cotton.

Table 7. Fish Early Life-Stage Toxicity Findings

Fish Early Life-Stage Toxicity Findings						
Species Tested	**% A.I.**	**NOEC (µg/L)**	**LOEC (µg/L)**	**MRID Author/Year**	**Endpoints Affected**	**Category**
Rainbow trout	96.7 Tech.	6.6	15	429186-27 Machado(1992)	Larval length	Core
Sheepshead minnow	97	0.24	0.41	44605502	Length/weight	Core

The results indicate that fipronil affects larval growth (length) at concentrations greater than 6.6 µg/L, but less than 15 µg/L (the next highest concentration tested) in rainbow trout. However, in marine fish species the results are much more dramatic. Both length and weight are affected at concentrations greater than 0.24 μg/L but not less than 0.41 μg/L (the next highest concentration tested).

Data from a marine fish full life-cycle test (Table 8) was required for fipronil due to the high chronic toxicity of the parent, persistence characteristics, and the probability fipronil will enter bodies of water from the proposed use on cotton.

Table 8. Fish Full Life-Cycle Toxicity Findings

Fish Early Life-Stage Toxicity Findings						
Species Tested	**% A.I.**	**NOEC (µg/L)**	**LOEC (µg/L)**	**MRID Author/Year**	**Endpoints Affected**	**Category**
Sheepshead minnow	95	0.85	1.7	45265101	Length	Core

Data from the marine fish full life cycle test (Table 8) show that growth affects (length) are demonstrated at test concentrations greater than 0.85 μg/L, but not less than 1.7μg/L (the next highest concentration tested). These results appear to suggest that marine fish exhibit higher chronic sensitivity than freshwater fish.

A freshwater aquatic invertebrate toxicity test (preferably using first instar *Daphnia magna* or early instar amphipods, stoneflies, mayflies, or midges) is required. The data are presented in Table 9.

Table 9. Freshwater Invertebrate Acute Toxicity Findings

Species Tested	% A.I.	48-h EC_{50} (µg/L)	MRID NO. Author/Year	Classification
Daphnia magna	100 Technical	190	429186-25 McNamara(1990)	Core
Daphnia magna (see 21 Day study)	100 % technical	39 (21 Day)	429186-26 McNamara(1990)	Supplemental
Daphnia magna	*94.7 photodeg. RPA 104615	100,000	432917-19 Collins(1992)	Supplemental
Daphnia magna	100% MB 46136 degradate	29	429186-71 McNamara(1990)	Supplemental
Daphnia magna	*100% MB 45950 degradate	100	429186-69 McNamara(1990)	Supplemental
Chironomus tepperi	20% (results adjusted) RP EXP 60145a	0.43	Stevens et. al 1998	Supplemental
Red Swamp Crayfish	*96.1 ICON 6.2 FS	174	450296-01	Supplemental

* studies used different degradates/metabolites of fipronil.

There is sufficient information to characterize fipronil parent and its degradates MB46136 and MB45950 as very highly toxic to freshwater aquatic invertebrates. It should be noted that there appears to be a great difference in sensitivity between the daphnid and chironomid. The chironomid results from the sediment toxicity study (Table 12) shows a similar sensitivity to this chironomid study. Therefore, additional data on other species which might shed light on the toxicity profile of fipronil is required. Suggested species which should be tested are mayflies, stoneflies, and caddis flies. In addition, the MB 46513 degradate should be tested using one or more of these species.

Because fipronil is proposed for use on crops which may be located adjacent to estuarine habitats, aquatic invertebrate testing with estuarine marine invertebrate species was required. Table 10 summarizes the results of these studies.

Table 10. Estuarine/Marine Invertebrate Acute Toxicity Results

Species	% A.I.	LC_{50}/EC_{50} (Cls) (µg/L)	MRID No. Author/Year	Classification
Eastern oyster	96.1	EC50=770 (180-1700)	432917-01 Dionne/1993	Core
Mysid	96.1	EC50=0.14 (0.12-0.16)	432797-01 Machado/1994	Upgraded to core
Mysid	97.8 MB 46513	EC50=1.5	451200-01	Core
Mysid	99.7 MB 46136	EC50=0.56	451563-01	Core
Mysid	99,7 M1B45950	EC50=0.077	451563-02	Core

The results from these studies indicates that there is sufficient information to characterize fipronil and it's degradates as highly toxic to oysters and very highly toxic to mysids.

Data from aquatic invertebrate life cycle tests are required due to persistence of fipronil in water, high acute toxicity and the probability that the compound will enter bodies of water from the proposed use on cotton In addition, when an end-use product is intended for direct application to the marine/estuarine environment or is expected to reach this environment in significant concentrations an invertebrate life cycle test with marine/estuarine invertebrate is required. The results of these studies are presented in Table 11.

Table 11. Aquatic Invertebrate Chronic Life-Cycle Toxicity Findings

Species Tested	% A.I.	LOEC/NOEC (µg/L)	MRID No. Author/Yr	Endpoints Affected	Classification
Mysid	97.7 Tech	LOEC 0.005 NOEC not determined	436812-01 Machado/1995	Survival Reproduction and Growth	Supplemental
Mysud	99.5 MB45950	LOEC 0.0087 NOEC 0.0046	45259202	Weight	Supplemental
Mysid	99 MB46136	LOEC 0.0026 NOEC < 0.0026	45259203	Weight	Supplemental
Daphnia magna	100 Tech	LOEC 20 NOEC 9.8	429186-26 McNamara/1990	Length	Supplemental

Species Tested	% A.I.	LOEC/NOEC (µg/L)	MRID No. Author/Yr	Endpoints Affected	Classification
Daphnia magna	MB46513	LOEC 100 NOEC 41	432797-04	Growth	Core
Daphnia magna	MB46136	LOEC 1.5 NOEC 0.63	DPR 15730	Weight	Core
Daphnia magna	MB46950	LOEC 22 NOEC 13	DPR 15730	Reproduction, growth	Core

The results indicate that fipronil affects growth in daphnids at concentrations exceeding 9.8 µg/L (MRID 42918626). The results also indicate that fipronil affects reproduction, survival and growth of mysids at concentrations less than 0.005 µg/L (MRID 436812-01). The mysid study does not meet guideline requirements because effects occurred at all test concentrations and an NOEC was not determined. The daphnia study does not meet guideline requirements because of high mortality in the dilution water control and high variability in the analytical measurements. Both studies with daphnids and mysids indicate that chronic exposure to fipronil may result in toxic effects at water concentrations substantially below acute effect levels. This potential for chronic effects and the persistence of fipronil suggested that the mysid and daphnid chronic studies should be repeated for the parent fipronil to support full registration on cotton, corn, and rice. In addition, chronic testing of the mysid shrimp for the MB 46513 would reduce uncertainties in the risk assessment.

The freshwater Daphnid studies suggest that chronic effects of the MB46136 degradate occur at considerably lower water concentrations than that of parent (NOEC = 0.63 μg/L). Marine invertebrate studies for the degradates MB 46136 and MB45950 show the same trends as the freshwater studies except that the toxicity is considerably greater (NOEC < 0.0026 μg/L).

Due to the extreme persistence and strong tendency for the parent and degradates to sorb to sediment, acute toxicity tests were submitted for the degradates MB 46136 and MB45950. The results presented in Table 12.

Table 12. Aquatic Invertebrate Acute Toxicity for Sediment Dwelling Organism Findings

Species Tested	% A.I.	Sediment growth/mortality EC_{50} / LC_{50} (µg/kg)	Pore Water growth/mortality EC_{50} / LC_{50} (µg/L)	MRID No. Author/Yr	Classification
Chironomus tentans	99.5 MB46136	34.8 / 44.8	0.41 / 0.72	45175901	Core
Chironomus tentans	MB46950	50.9 / 116.9	0.66 / 2.13	45084801	Core

The results of these tests show acute pore water toxicity concentrations considerably higher than the freshwater daphnids. In addition, data from another chironomid water column study (Stevens, et. al.) demonstrates similar toxicity to the sediment toxicity data. Chronic sediment toxicity tests on the parent and MB 46513 degradate have not been submitted. These tests as well as acute and chronic sediment toxicity testing on marine/estuarine species must also be submitted to reduce uncertainties in the risk assessment.

Toxicity to Terrestrial Plants

Currently, terrestrial plant testing is not required for pesticides other than herbicides except on a case-by-case basis (*e.g.*, labeling bears phytotoxicity warnings incident data or literature that demonstrate phytotoxicity). A literature search conducted by EFED revealed that contiguous seed exposure to fipronil (four days) at 2000 mg/L significantly impaired seed germination in rice.[1] However, fipronil is currently registered for seed treatment on rice at a rate of 0.05 lb ai.A. When converted, this application rate is equivalent to 22680 mg ai/A. This acreage can be converted to 5.6 mg ai/m^2. In order to convert the area covered in a square meter to a volume equivalent one could make the assumption that a 0.108 m water depth occupying a square meter would yield the volume equivalent of 1000 cm^3 or 1 Liter. The final concentration occupying this hypothetical 1 Liter volume would be 0.52 mg ai/L. This concentration is more than three orders of magnitude below the 2000 mg/L seed germination impairment endpoint. Therefore, EFED will not ask for terrestrial plant data at this time.

Toxicity to Aquatic Plants

Generally the Agency does not require terrestrial or aquatic plant testing for insecticide products. However, Tier I aquatic plant testing was provided due the probability that drift to aquatic habitats will occur from aerial applications to cotton. Table 13 presents the available data for 5 aquatic plant species.

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[1]Stevens, M.M., Fox KM; Coombes NE; Lewin LA (E-Mail: mark.stevens@agric.nsw.gov.au), Effect of fipronil seed treatments on the germination and early growth of rice, NSW Agr, Yanco Agr Inst, Private Mail Bag, Yanco, NSW 2703, Australia, PESTICIDE SCIENCE , 1999 , Volume: 55 , Number: 5 (MAY) , Page: 517-523.

Table 13. Nontarget Aquatic Plant Toxicity Findings

Species Tested	% A.I.	5 Day EC50 (µg/L)	NOEC (µg/L)	MRID # Author/ year	Classification
Navicula pelliculosa (FW diatom)	96.1	>120	120	42918658 Hoberg/1993	Core
Lemna gibbons (Duckweed)	96.1	>100	100	42918656 Hoberg/1993	Supplemental
Selena strum capricornutum (FW green alga)	96.1	140	<140	42918660 Hoberg/1993	Core
Skeletonema costatum (marine diatom)	96.1	>140	140	42918659 Hoberg/1993	Core
Anabaena flos aquae (FW Blue-green alga)	96.1	>170	140	42918657 Hoberg(1993)	Core

Appendix C: Exposure and Risk Characterization

EFED compares risk quotients to levels of concern to evaluate the likelihood of adverse ecological effects. Risk quotients (RQs) are determined by comparing estimated environmental concentrations (EECs) with ecotoxicity values, where:

RQ = EEC / TOXICITY

RQs are then compared to OPP's levels of concern (LOCs). Exceedance of an LOC indicates the potential for risk to nontarget organisms and the need for the Agency to consider regulatory action. If the RQ exceeds the LOC, the pesticide is presumed to have potential adverse effects.

acute risk:	regulatory action may be warranted in addition to restricted use classification
acute restricted use:	risk may be mitigated through restricted use classification
acute endangered species:	endangered species may be adversely affected
reproductive/chronic:	potential reproductive/chronic risk exists; regulatory action may be warranted to reduce risk

The ecotoxicity values for acute effects are:

- LC50: birds, fish, aquatic invertebrates
- LD50: mammals, birds
- EC50: aquatic plants, aquatic invertebrates
- EC25: terrestrial plants (non-endangered species)
- NOAEC: terrestrial and aquatic plants (endangered species)

The ecotoxicity values for reproductive/chronic effects are:

- NOAEC: birds, mammals, fish, aquatic invertebrates

Risk presumptions and the corresponding RQs and LOCs, are tabulated below.

Risk Presumption for Terrestrial Animals

Risk Presumption	RQ	LOC
Birds and Mammals:		
Acute Risk	EEC[1]/LC50 or LD50/sqft[2] or LD50/day[3]	0.5
Acute Restricted Use	EEC/LC50 or LD50/sqft or LD50/day (or LD50 < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC50 or LD50/sqft or LD50/day	0.1
Reproductive Risk	EEC/NOAEC	1
Fish and Aquatic Invertebrates:		
Acute Risk	EEC[4]/LC50 or EC50	0.5
Acute Restricted Use	EEC/LC50 or EC50	0.1
Acute Endangered Species	EEC/LC50 or EC50	0.05
Chronic Risk	EEC or NOAEC	1
Plants:		
Acute Risk	EEC[5]/EC25 (terrestrial) or EEC[4]/EC50 (aquatic)	1
Risk to Endangered Species	EEC/EC05 or NOAEC	1

[1] EEC= Estimated Environmental Concentration (ppm) on avian/mammalian food items

[2] $\frac{\text{mg toxicant/ft}^2}{\text{LD50 * wt. of bird}}$ [3] $\frac{\text{mg of toxicant consumed/day}}{\text{LD50 * wt. of bird}}$

[4] EEC = concentration (ppm or ppb) in water
[5] lb ai/A

Likelihood of Exposure

The expected environmental concentrations (likelihood of exposure) expected to result from the large acreage and diversity of species represented by cotton production is expected to be significant. Due to persistence of fipronil and it's degradates in terrestrial and aquatic ecosystems the potential duration and likelihood of prolonged exposure to non-target organisms should be taken into account.

Risk to Nontarget Terrestrial Animals

i. Birds, acute and chronic

For pesticides applied as a nongranular product (*e.g.*, liquid, dust), the estimated environmental concentrations (EECs) on food items following product application are compared to LC_{50} values to assess risk. The predicted 0-day maximum and mean residues of a pesticide that may be expected to occur on selected avian or mammalian food items immediately following a direct single application at 1 lb ai/A are tabulated below based on Hoerger and Kenaga (1972) as modified by Fletcher *et al.* (1994).

Estimated Environmental Concentrations on Avian and Mammalian Food Items (ppm) Following a Single Application at 1 lb ai/A)

Food Items	EEC (ppm) Predicted Maximum Residue[1]	EEC (ppm) Predicted Mean Residue[1]
Short grass	240	85
Tall grass	110	36
Broadleaf/forage plants and small insects	135	45
Fruits, pods, seeds, and large insects	15	7

[1] Predicted maximum and mean residues are for a 1 lb ai/a application rate and are based on Hoerger and Kenaga (1972) as modified by Fletcher *et al.* (1994).

Using the lowest LC_{50} value of 48 mg/kg-diet the following risk quotients are tabulated below in Table 1.

Table 1. Avian Acute and Chronic Risk Quotients for Single Application of Nongranular Products (Broadcast) Based on a Bobwhite Quail LC50 of 48 mg/kg-diet and a NOEC of 10 mg/kg-diet.

Site/App. Method	App. Rate (lbs ai/A)	Food Items	Maximum EEC (ppm)	LC50 (ppm)	NOEC (ppm)	Acute RQ (EEC/ LC50)	Chronic RQ (EEC/ NOEC)
Cotton, aerial & ground	0.05	Short grass	12	48	10	0.25**	1.20 ****
		Tall grass	6	48	10	0.13***	0.60
		Broadleaf plants/Insects	7	48	10	0.15***	0.70
		Seeds	1	48	10	0.02	0.10

* exceeds acute, acute restricted and acute endangered species LOCs.

** exceeds acute restricted and acute endangered species LOCs.

*** exceeds acute endangered species LOCs

**** exceeds chronic LOC.

An analysis of the results indicate that for a single broadcast application of nongranular products, avian acute, restricted use, and endangered species levels of concern are exceeded only for short grass at the maximum application rate of 0.05 lb ai/A.

Chronic risk quotients can be calculated based on the maximum and 56 day average residues on food items which result from the pesticide being applied repeatedly, but degrading over the course of time from the first application to the last application. To calculate these residues over time the EFED uses the FATE program which determines the maximum and 56 day average residues which occur in a one year time period. In the case of fipronil, the following input parameters were used. The application rate and minimum number of applications are determined from the proposed label and represent the highest single application rate. A seven day interval between applications was assumed. When EFED does not have data on foliar residues, a 35 day default half-life is assumed. The default length of simulation is for a one year time period.

Application Rate: 0.05 lb ai/A
Half-life: 35 days
Frequency of Application: 7 days
Minimum no. of applications: 4
Length of Simulation: 1 year

The results of the FATE run for fipronil are presented below.

Chemical Name: Fipronil (cotton)

Inputs

	Input Value?	
Application Rate	0.05	lb a.i./acre
Half-life	35	days
Frequency of Application	7	days
Maximum # Apps./Year	4	
Length of Simulation	1 year	
Level of Concern	80.00	(ppm)

Outputs

	Maximum Concentration (PPM)	56 Day Average Concentration (PPM)
Short Grass	39.46	25.74
Tall Grass	18.08	11.86
Broadleaf plants/Insects	22.20	14.64
Seeds	2.47	1.63

			# days Exceeded (in first 56)
Avian	Chronic NOAEL	1056	
	Acute LC50	480	

	Acute RQ	Chronic RQ
Short Grass	0.82	3.95
Tall Grass	0.38	1.81
Broadleaf plants/Insects	0.46	2.22
Seeds	0.05	0.25

			# days Exceeded (in first 56)
Mammalian	Chronic NOAEL	18560	
	Acute LC50	16530	

	Acute RQ	Chronic RQ
Short Grass	0.02	0.02
Tall Grass	0.01	0.01
Broadleaf plants/Insects	0.01	0.01

Seeds	0.00	0.00

The results for multiple applications using the lowest LC_{50} value of 48 mg/kg-diet the following risk quotients are tabulated below in Table 2.

Table 2. Avian Acute and Chronic Risk Quotients for Multiple Applications of Nongranular Products (Broadcast) Based on a Bobwhite Quail LC50 of 48 mg/kg-diet and a NOEC of 10 mg/kg-diet.

Site/App. Method	App. Rate (lbs ai/A)	Food Items	Maximum EEC (ppm)	LC50 (ppm)	NOEC (ppm)	Acute RQ (EEC/ LC50)	Chronic RQ (EEC/ NOEC)
Cotton, aerial & ground	0.05	Short grass	39.46	48	10	082*	3.90 ****
		Tall grass	18.08	48	10	0.38**	1.81****
		Broadleaf plants/Insects	22.20	48	10	0.46**	2.22 ****
		Seeds	2.47	48	10	0.05***	0.25

* exceeds acute, acute restricted and acute endangered species LOCs.

** exceeds acute restricted and acute endangered species LOCs.

*** exceeds acute endangered species LOCs

**** exceeds chronic LOC.

The above results indicate that for multiple broadcast applications of nongranular products, the avian acute risk, acute restricted, and acute endangered species levels of concern are exceeded only for birds foraging in short grass. The acute restricted and endangered species LOCs are exceeded for bird foraging in tall grass and broadleaf plants/insects. The acute endangered species LOC is exceeded only for birds foraging for seeds. The chronic risk LOC is exceeded at the proposed maximum application rates for all bird foraging groups with the exception of seeds.

However, EFED has found that the LD_{50} value is often a better indicator of acute toxicity to birds for acutely toxic pesticides. This is especially true when the LD_{50} is less than or equal to 50 mg/kg. When the LD_{50} is used, an estimate of the amount of pesticide that birds are likely to ingest for each of the food items listed above in a single day is calculated. The daily food ingestion rate (FI) based on dry weight is determined by Nagy's formula found in the Wildlife Exposure Factors Handbook FI(g-diet/day) = 0.648 x (gm bwt-diet)$^{0.651}$. This formula must be further modified to calculate the wet weight percentage of the bird's body weight consumed daily for each food type by dividing the percentage dry weight and multiplying by 100. The percentage dry weights for the food types are presented below.

Food Types	% Dry Weight
Short and tall grass	20
Broadleaf plants and insects	30
Seeds	90.8

To account for the wide range of bird weights, EFED uses 20 gm to represent the weight of small birds; 100 gm to represent medium size birds, and 1000 gm to represent the weight of large upland game birds and waterfowl. Therefore, this bird weight factor must also be accounted for in the formula by multiplying the weight of the bird in Kg. Thus the final formula for estimating the avian food ingestion rate in a day is:

$$FI_{(kg\ diet/day)} = 0.648 \text{ x } (\text{gm bwt/day})^{0.651} / (\%\text{ dry wt} \text{ x } 100) \text{ x } (1\text{Kg} / \text{gm bwt})$$

The amount of pesticide residues that a bird is likely in ingest on a daily basis would be determined by multiplying the predicted EEC values by the food ingestion rate equation presented above. Table 3 below presents the acute avian risk quotients for multiple applications. Table 4 presents acute avian risk quotients for single applications at the maximum label rate of 0.05 lb ai/A.

Table 3. Multiple Broadcast Applications

Avian Acute Risk Quotients for of Nongranular Products Based on a Bobwhite Quail LD50 of 11.3 mg/kg (Maximum Residue values)

Site/App. Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Maximum EEC 20 g Bird (mg/kg-diet)	Maximum EEC 100 g Bird (mg/kg-diet)	Maximum EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/ Day)	Acute RQ 100 g Bird (LD50/ Day)	Acute RQ 1000 g Bird (LD50/ Day)
Cotton/ aerial & Ground	0.05 (4)	Short grass	44.94	25.63	11.47	11.3	3.98 *	2.27 *	1.02 *
		Tall grass	20.59	11.74	5.26	11.3	1.82 *	1.04*	0.47 **
		Broadleaf plants/Insects	16.86	9.61	4.30	11.3	1.49 *	0.85*	0.38 **
		Seeds	0.62	0.12	0.16	11.3	0.05	0.01	0.01

Avian Acute Risk Quotients for Nongranular Products Based on a Bobwhite Quail LD50 of 11.3 mg/kg (Mean Residue values)

Site/App. Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Mean EEC 20 g Bird (mg/kg-diet)	Mean EEC 100 g Bird (mg/kg-diet)	Mean EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/Day)	Acute RQ 100 g Bird (LD50/Day)	Acute RQ 1000 g Bird (LD50/Day)
Cotton/ aerial & Ground	0.05 (4)	Short grass	29.00	16.54	7.41	11.3	2.57 *	1.46 *	0.66 *
		Tall grass	13.62	7.77	3.48	11.3	1.21 *	0.69 *	0.31 **
		Broadleaf plants/Insects	11.27	6.43	2.88	11.3	1.00 *	0.57 *	0.25 **
		Seeds	0.41	0.08	0.10	11.3	0.04	0.01	0.01

* Exceeds acute risk, acute restricted use risk, and endangered species risk LOCs
** Exceeds acute restricted use risk and endangered species risk LOCs
*** Exceeds endangered species risk LOCs

Table 4. Single Broadcast Applications

Avian Acute Risk Quotients for of Nongranular Products Based on a Bobwhite Quail LD50 of 11.3 mg/kg (Maximum Residue values)

Site/App. Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Maximum EEC 20 g Bird (mg/kg-diet)	Maximum EEC 100 g Bird (mg/kg-diet)	Maximum EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/Day)	Acute RQ 100 g Bird (LD50/Day)	Acute RQ 1000 g Bird (LD50/Day)
Cotton/ aerial & Ground	0.05 (1)	Short grass	13.67	1.60	3.49	11.3	1.21 *	0.14***	0.31 **
		Tall grass	6.26	3.57	1.60	11.3	0.55 *	0.32 **	0.14***
		Broadleaf plants/Insects	5.13	2.92	1.31	11.3	0.45 **	0.26 **	0.12***
		Seeds	0.19	0.04	0.05	11.3	0.02	0.00	0.00

Avian Acute Risk Quotients for Nongranular Products Based on a Bobwhite Quail LD50 of 11.3 mg/kg (Mean Residue values)

Site/App. Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Mean EEC 20 g Bird (mg/kg-diet)	Mean EEC 100 g Bird (mg/kg-diet)	Mean EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/ Day)	Acute RQ 100 g Bird (LD50/ Day)	Acute RQ 1000 g Bird (LD50/ Day)
Cotton/ aerial & Ground	0.05 (1)	Short grass	5.13	2.92	1.31	11.3	0.45 **	0.26 **	0.12***
		Tall grass	2.05	1.17	0.52	11.3	0.18***	0.10***	0.05
		Broadleaf plants/Insects	1.71	0.97	0.44	11.3	0.15***	0.09	0.04
		Seeds	0.09	0.02	0.02	11.3	0.01	0.00	0.00

* Exceeds acute risk, acute restricted use risk, and endangered species risk LOCs
** Exceeds acute restricted use risk and endangered species risk LOCs
*** Exceeds endangered species risk LOCs

Acute risk quotient LOCs are exceeded in either acute risk, acute restricted use risk, or endangered species for all food items except seeds for both maximum and mean residues.

In addition to highly toxic LD_{50} value of 11.3 mg/kg for the parent fipronil, the MB 46513 degradate has been demonstrated to have an even more highly toxic LD_{50} value of 5 mg/kg. The resulting acute RQs for multiple and single applications at maximum and mean residue levels are presented below in Tables 5 and 6.

Table 5. Multiple Broadcast Applications

Avian Acute Risk Quotients for of Nongranular MB 46513 Degradate Based on a Bobwhite Quail LD50 of 5 mg/kg (Maximum Residue values)

Site/App . Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Maximum EEC 20 g Bird (mg/kg-diet)	Maximum EEC 100 g Bird (mg/kg-diet)	Maximum EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/ Day)	Acute RQ 100 g Bird (LD50/ Day)	Acute RQ 1000 g Bird (LD50/ Day)
Cotton/ aerial & Ground	0.05 (4)	Short grass	44.94	25.63	11.47	5	8.99*	5.13*	2.29*
		Tall grass	20.59	11.74	5.26	5	4.12*	2.35*	1.05*
		Broadleaf plants/Insects	16.86	9.61	4.30	5	3.37*	1.92*	0.86*
		Seeds	0.62	0.12	0.16	5	0.12	0.02	0.03

Avian Acute Risk Quotients for Nongranular MB 46513 Degradate Based on a Bobwhite Quail LD50 of 5 mg/kg (Mean Residue values)

Site/App. Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Mean EEC 20 g Bird (mg/kg-diet)	Mean EEC 100 g Bird (mg/kg-diet)	Mean EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/Day)	Acute RQ 100 g Bird (LD50/Day)	Acute RQ 1000 g Bird (LD50/Day)
Cotton/ aerial & Ground	0.05 (4)	Short grass	29.00	16.54	7.41	5	5.80*	3.31*	1.48*
		Tall grass	13.62	7.77	3.48	5	2.72*	1.55*	0.70*
		Broadleaf plants/Insects	11.27	6.43	2.88	5	2.25*	1.29*	0.58*
		Seeds	0.41	0.08	0.10	5	0.08	0.02	0.02

* Exceeds acute risk, acute restricted use risk, and endangered species risk LOCs
** Exceeds acute restricted use risk and endangered species risk LOCs
*** Exceeds endangered species risk LOCs

Table 6. Single Broadcast Applications

Avian Acute Risk Quotients for of Nongranular MB 46513 Degradate Based on a Bobwhite Quail LD50 of 5 mg/kg (Maximum Residue values)

Site/App. Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Maximum EEC 20 g Bird (mg/kg-diet)	Maximum EEC 100 g Bird (mg/kg-diet)	Maximum EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/Day)	Acute RQ 100 g Bird (LD50/Day)	Acute RQ 1000 g Bird (LD50/Day)
Cotton/ aerial & Ground	0.05 (1)	Short grass	13.67	7.79	3.49	5	2.73*	1.56*	0.70*
		Tall grass	6.26	3.57	1.60	5	1.25*	0.71*	0.32**
		Broadleaf plants/Insects	5.13	2.92	1.31	5	1.03*	0.58*	0.26**
		Seeds	0.19	0.04	0.05	5	0.04	0.01	0.01

Avian Acute Risk Quotients for Nongranular MB 46513 Degradate Based on a Bobwhite Quail LD50 of 5 mg/kg (Mean Residue values)

Site/App. Method	App.Rate (lbs ai/A) No. of Apps.	Food Items	Mean EEC 20 g Bird (mg/kg-diet)	Mean EEC 100 g Bird (mg/kg-diet)	Mean EEC 1000 g Bird (mg/kg-diet	LD50 (mg/kg)	Acute RQ 20 g Bird (LD50/ Day)	Acute RQ 100 g Bird (LD50/ Day)	Acute RQ 1000 g Bird (LD50/ Day)
Cotton/ aerial & Ground	0.05 (1)	Short grass	5.13	2.92	1.31	5	1.03*	0.58*	0.26**
		Tall grass	2.05	1.17	0.52	5	0.41**	0.23**	0.10***
		Broadleaf plants/Insects	1.71	0.97	0.44	5	0.34**	0.19***	0.09
		Seeds	0.09	0.02	0.02	5	0.02	0.00	0.00

* Exceeds acute risk, acute restricted use risk, and endangered species risk LOCs
** Exceeds acute restricted use risk and endangered species risk LOCs
*** Exceeds endangered species risk LOCs

Acute risk quotient LOCs for the MB 46513 degradate are exceeded for the acute risk, acute restricted use risk, or endangered species for all food items and body weight classes except seeds for both maximum and mean residues. These LOC exceedances are significantly greater than the parent fipronil.

Although not requested by EFED, the registrant submitted an avian field study (MRID # 451359-01) which measured actual field concentrations of fipronil and its metabolites on various avian food sources (excluding short and tall grasses) under conditions which more closely represent actual field applications to cotton fields. The application rate of 0.075 lb ai/A was higher than the proposed label rate of 0.05 lb ai/A. The application intervals was 7 to 10 days with a maximum 4 applications per year. The study concluded that resulting risk quotients ranged from <0.01 to 0.09 using the lowest dietary LC_{50} value and that a 135 g bird would have to consume about 180% of its body weight as one dose to achieve an LD_{50}. EFED finds that the residues and conclusions of this study generally follow the Agency's conclusions regarding risks associated with consumption of these food types (seeds and insects). However, the study did not address residues in broadleaf plants or grasses; the food types of most concern according to EFED's modeling. Even though the study did not measure these residues, it is possible to use the available data for seeds from the field study to make inferences regarding EFED's modeling approach for broadleaf plants and grasses. This can be accomplished by comparing the relationship between measured seed residues and application rate for both the EFED exposure model and the registrant's field study. For the registrant's study, seed residues normalized to 1 lb ai/acre, yields a residue of 62 ppm/lb ai/acre. A similar normalization to 1 lb ai/acre for EFED modeled seed residues, yields a residue of 49 ppm/lb ai/acre. This suggests that EFED's residue estimates are less conservative and if the relationship holds for other vegetative matter also suggests that EFED's modeled residue estimates for grasses and broadleaf vegetation may be **less** conservative than would be expected if residues in these food types were actually measured. In addition there is also an issue of whether a single study can be applied to a wide variety of application scenarios that may be anticipated for cotton use of fipronil. The study also has some technical limitations. Although the study was conducted in a scientifically sound manner, the impact of collection of samples on days which rain occurred was not discussed. The study authors made no mention if any of the residue concentrations could have been washed off during the collections. This issue should have been addressed in the study.

ii. Mammals, acute and chronic

Estimating the potential for adverse effects to wild mammals is based upon EEB's draft 1995 SOP of mammalian risk assessments and methods used by Hoerger and Kenaga (1972) as modified by Fletcher *et al.* (1994). The concentration of fipronil and its degradates in the diet that is expected to be acutely lethal to 50% of the test population (LC50) is determined by dividing the LD50 value (usually rat LD50) by the % (decimal of) body weight consumed. A risk quotient is then determined by dividing the EEC by the derived LC50 value. Risk quotients are calculated for three separate weight classes of mammals (15, 35, and 1000 g), each presumed to consume four different kinds of food (grass, forage, insects, and seeds). The acute risk quotients for broadcast applications of nongranular products are tabulated below in Tables 7 and 8.

Table 7. Mammalian (Herbivore/Insectivore) Acute Risk Quotients Multiple Applications of Nongranular Products (Broadcast) Based on a Northern Bobwhite Quail LD50 of 97 mg/Kg.-diet

Site/ App. Method/ Rate in lbs ai/A (No. of Apps.)	Body Weight (g)	% Body Weight Consumed	Rat LD50 (mg/kg)	EEC (ppm) Short Grass	EEC (ppm) Forage & Small Insects	EEC (ppm) Large Insects	Acute RQ[1] Short Grass	Acute RQ Forage & Small Insects	Acute RQ Large Insects
Cotton/aerial & Ground									
0.05 (4))	15	95	97	39.06	18.02	22.2	0.38**	0.18***	0.22**
0.05 (4)	35	66	97	39.06	18.02	22.2	0.27**	0.12***	0.15***
0.05 (4)	1000	15	97	39.06	18.02	22.2	0.06	0.03	0.03

[1] RQ = $\frac{\text{EEC (ppm)}}{\text{LD50 (mg/kg)/ \% Body Weight Consumed}}$

Table 8. Mammalian (Granivore) Acute Risk Quotients for Multiple Applications of Nongranular Products (Broadcast) Based on a Northern Bobwhite Quail LD50 of 97 mg/Kg-diet.

Site/ App. Method	Rate in lbs ai/A (No. of Apps.)	Body Weight (g)	% Body Weight Consumed	Rat LD50 (mg/kg)	EEC (ppm) Seeds	Acute RQ[1] Seeds
Cotton /aerial & ground	0.05 (4)	15	21	97	2.47	0.0053
	0.05 (4)	35	15	97	2.47	0.0038
	0.05 (4)	1000	3	97	2.47	0.0008

[1] $RQ = \frac{\text{EEC (ppm)}}{\text{LD50 (mg/kg)/ \% Body Weight Consumed}}$

An analysis of the results indicate that for broadcast applications of nongranular products, mammalian acute restricted use, and endangered species levels of concern are exceeded only for 15 and 35 g herbivores/Insectivores at registered maximum application rates. Risk Quotients for all granivores are not exceeded.

The chronic risk quotients for multiple broadcast applications of nongranular products based on FATE are tabulated below in Table 9.

Table 9. Mammalian Chronic Risk Quotients for Multiple Applications of Nongranular Products (Broadcast) Based on a NOEC of 30 mg/kg-diet in a Multi-generation Rat Study

Site/Application Method	Application Rate in lbs ai/A (No. of Apps.)	Food Items	Max. EEC[1] (ppm)	NOEC (ppm)	Chronic RQ Max. EEC/NOEC)
Cotton/ aerial & ground	0.05 (4)	Short grass	39.46	30	1.32
		Tall grass	18.08	30	0.60
		Broadleaf plants/Insects	22.2	30	0.74
		Seeds	2.47	30	0.08

[1] Assumes degradation using FATE program.
[2] Average residues during time from first to last application.

The above results indicate that for multiple broadcast applications of nongranular products, the mammalian chronic level of concern is exceeded at proposed maximum application rates only for small mammals foraging in short grass.

iv. Insects

Currently, EFED does not assess risk to nontarget insects. Results of acceptable studies are used for recommending appropriate label precautions.

Risk to Nontarget Aquatic Organisms

Likelihood of Exposure

Fipronil displays high toxicity to most aquatic organisms tested to date. The large multi-state area that may be encompassed by this use pattern will undoubtedly include sites which are adjacent to irrigation canals, streams, ponds, rivers, lakes and estuarine habitats. Thus, the aquatic species diversity which is potentially at risk to exposure from drift and runoff is large.

As explained in the aquatic exposure assessment section, the Tier II PRZM-EXAMS model simulation for aquatic environments indicates the 1 in 10 year daily peak and 21 day average concentration for fipronil is not likely to exceed 3.0 and 2.0 µg/L, respectively. The same modeling for individual degradates indicated that residues accumulated in the field pond environment due to the high persistence of fipronil degradation products in aquatic environments. The peak concentration of fipronil residues ranged from 0.7 to 2.0 µg/L for MB 45950, 2.9 to 7.1 µg/L for MB46136, and 5.5 to 21.8 µg/L for MB 46513 over a 1 to 20 year averaging period. The resulting Risk Quotients are tabulated below for the parent fipronil (Table 10) and for the degradates (Table 11).

Table 10. Aquatic Organism Risk Quotient Calculations for Fipronil Under Maximum Application Rate Scenario

Aquatic Organism	Acute Toxicity Threshold (ug/L)	Chronic Toxicity Threshold (ug/L)	Peak Water Concentration (ug/L)	Acute RQ	21-day Average Water Concentration (ug/L)	60-day Average Water Concentration (ug/L)	Chronic RQ Peak/21da/60da
Freshwater Fish	83	6.6	2.92	0.035	1.72	1.44	0.44
Freshwater Invertebrates	0.43	0.022[1]	2.92	6.8*	1.72	1.44	**132/78/65 ******
Estuarine Fish	130	0.24	2.92	0.022	1.72	1.44	**12/7.2/6 ******
Estuarine Invet.	0.14	0.005	2.92	20.86*	1.72	1.44	**584/344/288******

* Exceeds acute risk, restricted use, and endangered species LOCs

** Exceeds restricted use and endangered species LOCs

*** Exceeds endangered species LOCs
**** Exceeds chronic risk LOCs
[1] Chironomid acute value multiplied by chronic to acute ratio for daphnid studies of compound

An analysis of the results indicate that aquatic acute risk, restricted use, and endangered species levels of concern are exceeded for freshwater and marine/estuarine invertebrates at the proposed maximum application rate. The exceedences are quite high for marine invertebrates. (RQ=20.86). The chronic level of concern is exceeded more than 580 fold for marine invertebrates, 130 fold for freshwater invertebrates, and 12 fold for marine fish using the peak exposure concentration. No other exceedences are noted with any other freshwater organisms for the parent fipronil.

Table 11. Aquatic Organism Risk Quotient for Fipronil Degradates Under Maximum Application Rate Scenario at Peak Concentrations in a 1 Year (20 Year Peak water concentrations for comparison)

Chemical	Acute Toxicity Threshold (ug/L)	Chronic Toxicity Threshold (ug/L)	1 Year Peak Water Concentration (ug/L)	Acute RQ	Chronic RQ[1]	20 Year Peak Water Concentration (ug/L)
Freshwater Fish						
MB46136	25	2.0[2]	2.90	0.12 **	1.46 ****	7.1
MB46513	20	1.6[2]	5.50	0.28 **	3.46 ****	21.80
MB45950	83[3]	6.6[3]	0.70	0.008	0.11	2.00
Freshwater Invertebrates						
MB46136	0.72	0.016[4]	2.90	4.03*	181 ****	7.1
MB46513	0.43[3]	0.022[4]	5.50	12.8*	250 ****	21.80
MB45950	2.13	0.277 [4]	0.70	0.33**	2.53 ****	2.00
Estuarine Fish						
MB46136	39[5]	0.07[6]	2.90	0.074 ***	41.43 ****	7.1
MB46513	31[5]	0.06[6]	5.50	0.177 **	91.67 ****	21.80
MB45950	130[3]	0.24[3]	0.70	0.005	2.92 ****	2.00
Estuarine Invertebrates						
MB46136	0.02[7]	0.0026	2.90	145*	1115.38 ****	7.1
MB46513	0.14[3]	0.005[3]	5.50	39.29*	1100.00 ****	21.80
MB45950	0.07[7]	0.005	0.70	10 *	152.17 ****	2.00
Freshwater Sediment Dwelling Organisms (pore water)						
MB46136	0.41 / 0.72[8]	0.016[4]	2.90	7.07 / 4.02*	181****	7.1

Chemical	Acute Toxicity Threshold (ug/L)	Chronic Toxicity Threshold (ug/L)	1 Year Peak Water Concentration (ug/L)	Acute RQ	Chronic RQ[1]	20 Year Peak Water Concentration (ug/L)
MB45950	0.66 / 2.13[8]	0.28[4]	0.70	**1.06** / 0.33*	2.5 ****	2.00

[1]Chronic Risk Quotients based on 1 year accumulated peak values.
[2] Most sensitive species tested acute value multiplied by chronic:acute ratio of parent fipronil
[3]Assumed to be as toxic as the parent
[4] Chironomid acute value multiplied by chronic to acute ratio for daphnid studies of compound
[5] Parent fipronil acute value multiplied by metabolite:parent fipronil ratio for freshwater fish acute values
[6] Parent fipronil chronic value multiplied by metabolite:parent fipronil ratio for freshwater fish acute values
[7] Acute freshwater metabolite value multiplied by acute estuarine:acute freshwater ratio for parent fipronil
[8] Growth EC_{50}/Mortality EC_{50}

* Exceeds acute risk, restricted use, and endangered species LOCs
** Exceeds restricted use and endangered species LOCs
*** Exceeds endangered species LOCs
**** Exceeds chronic risk LOCs

An analysis of the results indicate that only acute restricted use and endangered species levels of concern are exceeded for freshwater and marine fish for the MB 46136 and MB45513 degradates. Chronic LOCs for freshwater and marine fish were exceeded for all degradates except the MB 45950 degradate. Chronic RQs for marine fish exceeded the LOCs by more than an order of magnitude for the MB 46136 and MB 46513 degradates.

Aquatic invertebrate acute risk, restricted use, and endangered species LOCs are exceeded for all degradates except the freshwater invertebrate MB 45950 degradate. These RQs range from 0.33 to 145, and the LOCs for marine invertebrates were exceeded by more than two orders of magnitude for the MB 46136 degradate and more than one order for the MB 46513 and MB 45950 degradates. The marine chronic invertebrate LOCs were exceeded by more than three orders of magnitude for the MB 46136 and the MB 46513 degradates and by more than two orders of magnitude for the MB 45950 degradate. The freshwater invertebrate chronic LOCs were exceeded by two orders of magnitude for the

MB 46136 and MB 46513 degradates. The LOC for the MB 45950 degradate was exceeded by 2.53X.

Acute RQs ranged from 4.02 to 7.07 for the freshwater chironomids tested in sediment when compared to pore water concentrations for the degradate MB 46136 for the mortality and growth endpoints, respectively. The MB 45950 degradate RQs ranged from 0.33 to 1.06 for the for the mortality and growth endpoints respectively. No chronic studies were submitted for any of the degradates, however when the freshwater invertebrate acute/chronic ratio is applied to freshwater sediment invertebrates the resulting chronic RQs range from 2.5 for the MB 45950 degradate to 181 for the MB 46136 degradate.

Exposure and Risk to Nontarget Plants

i. Terrestrial Plants

EFED has not required testing on terrestrial plants, and therefore, can not calculate risk quotients for terrestial plants.

ii. Aquatic Plants

Acute risk quotients for vascular and non-vascular plants are tabulated below (Table 13). The assessment for non-endangered and endangered vascular aquatic plants is based on the toxicity of fipronil to duckweed, whereas that for nonvascular, non-endangered plants uses the toxicity to the most sensitive algae or diatom species. Currently, there are no Federally listed endangered or threatened nonvascular aquatic plants.

Table 13. Acute and Chronic Risk Quotients for Aquatic Plants

Site	Appl. rate (lb ai/A)	No. appl.	EEC model	Peak EEC ($\mu g/L$)	Species group	Endangered Species RQ (EEC/NOAEC)[1]	Non-Endangered plant RQ (EEC/EC_{50})[2]
Cotton	0.05	4	PRZM-EXAMS	3.00	vascular non-vascular	0.03 0.025	<0.03 <0.025

[1] based on the duckweed NOAEC of 0.54 ppm
[2] based on the duckweed EC50 of 0.70 ppm and the blue-green algae EC50 of 0.92 ppm

An analysis of the results indicates that aquatic plant acute and chronic levels of concern are not exceeded for vascular and non-vascular aquatic plants at 0.05 lb ai/A.

Appendix V: PRZM-EXAMS DOCUMENTATION FOR FIPRONIL USE ON COTTON

Fipronil Input for MSPOND (C:\hetrick\przm\przm3\przm312\fipronil\ffol2.inp)

```
*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: Fipronil
Location: Mississippi; Crop: cotton;  MLRA: O-134
  0.76   0.15    0  17.00    1     1
   4
  0.49   0.40   0.75    10   5.80     4   6.00  354.0
   3
   1   0.20  125.00  98.00     3  99  93  92          0.00  120.00
   2   0.20  125.00  98.00     3  94  84  83          0.00  120.00
   3   0.20  125.00  98.00     3  99  83  83          0.00  120.00
   1    3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
   2    3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
   3    3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
   20
 01 564  07 964  220964    1
 01 565  07 965  220965    2
 01 566  07 966  220966    3
 01 567  07 967  220967    1
 01 568  07 968  220968    2
 01 569  07 969  220969    3
 01 570  07 970  220970    1
 01 571  07 971  220971    2
 01 572  07 972  220972    3
 01 573  07 973  220973    1
 01 574  07 974  220974    2
 01 575  07 975  220975    3
 01 576  07 976  220976    1
 01 577  07 977  220977    2
 01 578  07 978  220978    3
 01 579  07 979  220979    1
 01 580  07 980  220980    2
 01 581  07 981  220981    3
 01 582  07 982  220982    1
 01 583  07 983  220983    2
Application schedule: 4 (appl. method) apps @ .224kg/ha @ 95% eff w/ 5% drift
   80    1    0    0
```

Chemical: Koc = 726; AESM t1/2 = 128days

```
260564 0 2 0.00 .056 0.95 0.05
020664 0 2 0.00 .056 0.95 0.05
090664 0 2 0.00 .056 0.95 0.05
160664 0 2 0.00 .056 0.95 0.05
260565 0 2 0.00 .056 0.95 0.05
020665 0 2 0.00 .056 0.95 0.05
090665 0 2 0.00 .056 0.95 0.05
160665 0 2 0.00 .056 0.95 0.05
260566 0 2 0.00 .056 0.95 0.05
020666 0 2 0.00 .056 0.95 0.05
090666 0 2 0.00 .056 0.95 0.05
160666 0 2 0.00 .056 0.95 0.05
260567 0 2 0.00 .056 0.95 0.05
020667 0 2 0.00 .056 0.95 0.05
090667 0 2 0.00 .056 0.95 0.05
160667 0 2 0.00 .056 0.95 0.05
260568 0 2 0.00 .056 0.95 0.05
020668 0 2 0.00 .056 0.95 0.05
090668 0 2 0.00 .056 0.95 0.05
160668 0 2 0.00 .056 0.95 0.05
260569 0 2 0.00 .056 0.95 0.05
020669 0 2 0.00 .056 0.95 0.05
090669 0 2 0.00 .056 0.95 0.05
160669 0 2 0.00 .056 0.95 0.05
260570 0 2 0.00 .056 0.95 0.05
020670 0 2 0.00 .056 0.95 0.05
090670 0 2 0.00 .056 0.95 0.05
160670 0 2 0.00 .056 0.95 0.05
260571 0 2 0.00 .056 0.95 0.05
020671 0 2 0.00 .056 0.95 0.05
090671 0 2 0.00 .056 0.95 0.05
160671 0 2 0.00 .056 0.95 0.05
260572 0 2 0.00 .056 0.95 0.05
020672 0 2 0.00 .056 0.95 0.05
090672 0 2 0.00 .056 0.95 0.05
160672 0 2 0.00 .056 0.95 0.05
260573 0 2 0.00 .056 0.95 0.05
020673 0 2 0.00 .056 0.95 0.05
090673 0 2 0.00 .056 0.95 0.05
160673 0 2 0.00 .056 0.95 0.05
260574 0 2 0.00 .056 0.95 0.05
020674 0 2 0.00 .056 0.95 0.05
090674 0 2 0.00 .056 0.95 0.05
160674 0 2 0.00 .056 0.95 0.05
260575 0 2 0.00 .056 0.95 0.05
020675 0 2 0.00 .056 0.95 0.05
090675 0 2 0.00 .056 0.95 0.05
160675 0 2 0.00 .056 0.95 0.05
260576 0 2 0.00 .056 0.95 0.05
020676 0 2 0.00 .056 0.95 0.05
090676 0 2 0.00 .056 0.95 0.05
160676 0 2 0.00 .056 0.95 0.05
260577 0 2 0.00 .056 0.95 0.05
020677 0 2 0.00 .056 0.95 0.05
090677 0 2 0.00 .056 0.95 0.05
160677 0 2 0.00 .056 0.95 0.05
260578 0 2 0.00 .056 0.95 0.05
020678 0 2 0.00 .056 0.95 0.05
090678 0 2 0.00 .056 0.95 0.05
```

```
160678  0 2 0.00  .056 0.95 0.05
260579  0 2 0.00  .056 0.95 0.05
020679  0 2 0.00  .056 0.95 0.05
090679  0 2 0.00  .056 0.95 0.05
160679  0 2 0.00  .056 0.95 0.05
260580  0 2 0.00  .056 0.95 0.05
020680  0 2 0.00  .056 0.95 0.05
090680  0 2 0.00  .056 0.95 0.05
160680  0 2 0.00  .056 0.95 0.05
260581  0 2 0.00  .056 0.95 0.05
020681  0 2 0.00  .056 0.95 0.05
090681  0 2 0.00  .056 0.95 0.05
160681  0 2 0.00  .056 0.95 0.05
260582  0 2 0.00  .056 0.95 0.05
020682  0 2 0.00  .056 0.95 0.05
090682  0 2 0.00  .056 0.95 0.05
160682  0 2 0.00  .056 0.95 0.05
260583  0 2 0.00  .056 0.95 0.05
020683  0 2 0.00  .056 0.95 0.05
090683  0 2 0.00  .056 0.95 0.05
160683  0 2 0.00  .056 0.95 0.05
  0.00      1
    0  5.4E-3    0.5
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
  0.00   0.00  0.00
    6
    1  13.00  1.400  0.385  0.000  0.000  0.000
     5.40E-3 5.40E-3  0.000
       0.100  0.385  0.151  2.180  15.84
    2  23.00  1.400  0.370  0.000  0.000  0.000
     5.40E-3 5.40E-3  0.000
       1.000  0.370  0.146  0.490  3.56
    3  33.00  1.400  0.370  0.000  0.000  0.000
     5.40E-3 5.40E-3  0.000
       1.000  0.370  0.146  0.160  1.16
    4  30.00  1.450  0.340  0.000  0.000  0.000
     5.40E-3 5.40E-3  0.000
       1.000  0.340  0.125  0.124  0.09
    5  23.00  1.490  0.335  0.000  0.000  0.000
     5.40E-3 5.40E-3  0.000
       1.000  0.335  0.137  0.070  0.51
    6  33.00  1.510  0.343  0.000  0.000  0.000
     5.40E-3 5.40E-3  0.000
       1.000  0.343  0.147  0.060  0.44
    0
  WATR   YEAR    10   PEST   YEAR     10   CONC   YEAR     10  1
    1
    1 -----
    7  DAY
  PRCP   TSER  0  0
  RUNF   TSER  0  0
  INFL   TSER  1  1
  ESLS   TSER  0  0  1.E3
  RFLX   TSER  0  0  1.E5
  EFLX   TSER  0  0  1.E5
  RZFX   TSER  0  0  1.E5
```

Fipronil Concentrations in MSPOND

(C:\hetrick\przm\przm3\fipronil\ffol3.out)

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1964	1.305	1.177	.881	.653	.535	.248
1965	1.255	1.097	.691	.341	.249	.110
1966	.726	.639	.390	.215	.193	.071
1967	1.242	1.094	.890	.587	.493	.190
1968	.360	.317	.277	.180	.139	.064
1969	.378	.328	.229	.158	.150	.055
1970	.893	.801	.665	.559	.489	.197
1971	.545	.477	.295	.214	.197	.099
1972	.359	.316	.235	.148	.115	.046
1973	.454	.398	.301	.196	.183	.101
1974	.595	.523	.439	.241	.186	.103
1975	1.201	1.050	.791	.540	.454	.147
1976	1.523	1.331	.868	.576	.501	.200
1977	.449	.395	.286	.256	.220	.093
1978	.329	.289	.237	.171	.136	.061
1979	4.088	3.675	2.594	1.610	1.307	.449
1980	.349	.308	.254	.178	.136	.059
1981	2.014	1.795	1.101	.582	.442	.136
1982	3.020	2.650	1.785	1.516	1.165	.389
1983	.343	.298	.224	.143	.140	.074

SORTED FOR PLOTTING

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	4.088	3.675	2.594	1.610	1.307	.449
.095	3.020	2.650	1.785	1.516	1.165	.389
.143	2.014	1.795	1.101	.653	.535	.248
.190	1.523	1.331	.890	.587	.501	.200
.238	1.305	1.177	.881	.582	.493	.197
.286	1.255	1.097	.868	.576	.489	.190
.333	1.242	1.094	.791	.559	.454	.147
.381	1.201	1.050	.691	.540	.442	.136
.429	.893	.801	.665	.341	.249	.110
.476	.726	.639	.439	.256	.220	.103
.524	.595	.523	.390	.241	.197	.101
.571	.545	.477	.301	.215	.193	.099
.619	.454	.398	.295	.214	.186	.093
.667	.449	.395	.286	.196	.183	.074
.714	.378	.328	.277	.180	.150	.071
.762	.360	.317	.254	.178	.140	.064
.810	.359	.316	.237	.171	.139	.061
.857	.349	.308	.235	.158	.136	.059
.905	.343	.298	.229	.148	.136	.055
.952	.329	.289	.224	.143	.115	.046

1/10	2.919	2.564	1.717	1.430	1.102	.375

MEAN OF ANNUAL VALUES = .145

STANDARD DEVIATION OF ANNUAL VALUES = .110

UPPER 90% CONFIDENCE LIMIT ON MEAN = .181

Fipronil Input for Index Reservoir (c:\hetrick\przm\przm3\przm312\fipronil\ffolir1.inp)

```
*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: Fipronil
```

```
Location: Mississippi; Crop: cotton;  MLRA: O-134
   0.76    0.15      0  17.00      1      1
     4
   0.49    0.40    0.75  172.80    5.80      4    6.00   600.0
     3
     1    0.20  125.00   98.00      3  99  93  92            0.00  120.00
     2    0.20  125.00   98.00      3  94  84  83            0.00  120.00
     3    0.20  125.00   98.00      3  99  83  83            0.00  120.00
     1      3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
     2      3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
     3      3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
    20
  01 564  07 964  220964      1
  01 565  07 965  220965      2
  01 566  07 966  220966      3
  01 567  07 967  220967      1
  01 568  07 968  220968      2
  01 569  07 969  220969      3
  01 570  07 970  220970      1
  01 571  07 971  220971      2
  01 572  07 972  220972      3
  01 573  07 973  220973      1
  01 574  07 974  220974      2
  01 575  07 975  220975      3
  01 576  07 976  220976      1
  01 577  07 977  220977      2
  01 578  07 978  220978      3
  01 579  07 979  220979      1
  01 580  07 980  220980      2
  01 581  07 981  220981      3
  01 582  07 982  220982      1
  01 583  07 983  220983      2
Application schedule: 4 (appl. method) apps @ .224kg/ha @ 95% eff w/ 16% drift
    80      1      0      0
Chemical: Koc = 726; AESM t1/2 = 128 days
 260564  0 2 0.00  .056 0.95 0.16
 020664  0 2 0.00  .056 0.95 0.16
 090664  0 2 0.00  .056 0.95 0.16
 160664  0 2 0.00  .056 0.95 0.16
 260565  0 2 0.00  .056 0.95 0.16
 020665  0 2 0.00  .056 0.95 0.16
 090665  0 2 0.00  .056 0.95 0.16
 160665  0 2 0.00  .056 0.95 0.16
 260566  0 2 0.00  .056 0.95 0.16
 020666  0 2 0.00  .056 0.95 0.16
 090666  0 2 0.00  .056 0.95 0.16
 160666  0 2 0.00  .056 0.95 0.16
 260567  0 2 0.00  .056 0.95 0.16
 020667  0 2 0.00  .056 0.95 0.16
 090667  0 2 0.00  .056 0.95 0.16
 160667  0 2 0.00  .056 0.95 0.16
```

260568	0	2	0.00	.056	0.95	0.16
020668	0	2	0.00	.056	0.95	0.16
090668	0	2	0.00	.056	0.95	0.16
160668	0	2	0.00	.056	0.95	0.16
260569	0	2	0.00	.056	0.95	0.16
020669	0	2	0.00	.056	0.95	0.16
090669	0	2	0.00	.056	0.95	0.16
160669	0	2	0.00	.056	0.95	0.16
260570	0	2	0.00	.056	0.95	0.16
020670	0	2	0.00	.056	0.95	0.16
090670	0	2	0.00	.056	0.95	0.16
160670	0	2	0.00	.056	0.95	0.16
260571	0	2	0.00	.056	0.95	0.16
020671	0	2	0.00	.056	0.95	0.16
090671	0	2	0.00	.056	0.95	0.16
160671	0	2	0.00	.056	0.95	0.16
260572	0	2	0.00	.056	0.95	0.16
020672	0	2	0.00	.056	0.95	0.16
090672	0	2	0.00	.056	0.95	0.16
160672	0	2	0.00	.056	0.95	0.16
260573	0	2	0.00	.056	0.95	0.16
020673	0	2	0.00	.056	0.95	0.16
090673	0	2	0.00	.056	0.95	0.16
160673	0	2	0.00	.056	0.95	0.16
260574	0	2	0.00	.056	0.95	0.16
020674	0	2	0.00	.056	0.95	0.16
090674	0	2	0.00	.056	0.95	0.16
160674	0	2	0.00	.056	0.95	0.16
260575	0	2	0.00	.056	0.95	0.16
020675	0	2	0.00	.056	0.95	0.16
090675	0	2	0.00	.056	0.95	0.16
160675	0	2	0.00	.056	0.95	0.16
260576	0	2	0.00	.056	0.95	0.16
020676	0	2	0.00	.056	0.95	0.16
090676	0	2	0.00	.056	0.95	0.16
160676	0	2	0.00	.056	0.95	0.16
260577	0	2	0.00	.056	0.95	0.16
020677	0	2	0.00	.056	0.95	0.16
090677	0	2	0.00	.056	0.95	0.16
160677	0	2	0.00	.056	0.95	0.16
260578	0	2	0.00	.056	0.95	0.16
020678	0	2	0.00	.056	0.95	0.16
090678	0	2	0.00	.056	0.95	0.16
160678	0	2	0.00	.056	0.95	0.16
260579	0	2	0.00	.056	0.95	0.16
020679	0	2	0.00	.056	0.95	0.16
090679	0	2	0.00	.056	0.95	0.16
160679	0	2	0.00	.056	0.95	0.16
260580	0	2	0.00	.056	0.95	0.16
020680	0	2	0.00	.056	0.95	0.16
090680	0	2	0.00	.056	0.95	0.16
160680	0	2	0.00	.056	0.95	0.16
260581	0	2	0.00	.056	0.95	0.16
020681	0	2	0.00	.056	0.95	0.16
090681	0	2	0.00	.056	0.95	0.16
160681	0	2	0.00	.056	0.95	0.16
260582	0	2	0.00	.056	0.95	0.16
020682	0	2	0.00	.056	0.95	0.16
090682	0	2	0.00	.056	0.95	0.16
160682	0	2	0.00	.056	0.95	0.16

```
260583  0 2 0.00  .056 0.95 0.16
020683  0 2 0.00  .056 0.95 0.16
090683  0 2 0.00  .056 0.95 0.16
160683  0 2 0.00  .056 0.95 0.16
 0.00     1
   0  5.4E-3    0.5
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
  0.00    0.00   0.00
    6
    1   13.00   1.400   0.385   0.000   0.000   0.000
      5.40E-3 5.40E-3   0.000
        0.100   0.385   0.151   2.180   15.84
    2   23.00   1.400   0.370   0.000   0.000   0.000
      5.40E-3 5.40E-3   0.000
        1.000   0.370   0.146   0.490   3.56
    3   33.00   1.400   0.370   0.000   0.000   0.000
      5.40E-3 5.40E-3   0.000
        1.000   0.370   0.146   0.160   1.16
    4   30.00   1.450   0.340   0.000   0.000   0.000
      5.40E-3 5.40E-3   0.000
        1.000   0.340   0.125   0.124   0.09
    5   23.00   1.490   0.335   0.000   0.000   0.000
      5.40E-3 5.40E-3   0.000
        1.000   0.335   0.137   0.070   0.51
    6   33.00   1.510   0.343   0.000   0.000   0.000
      5.40E-3 5.40E-3   0.000
        1.000   0.343   0.147   0.060   0.44
    0
  WATR    YEAR     10    PEST    YEAR     10    CONC    YEAR     10  1
    1
    1  -----
    7   DAY
  PRCP    TSER   0   0
  RUNF    TSER   0   0
  INFL    TSER   1   1
  ESLS    TSER   0   0   1.E3
  RFLX    TSER   0   0   1.E5
  EFLX    TSER   0   0   1.E5
  RZFX    TSER   0   0   1.E5
```

Fipronil Concentrations in Index Reservoir (C:\hetrick\przm\przm3\przm312\fipronil\ffolir3.out)

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
----	----	-------	------	------	------	------
1964	3.262	2.986	2.276	1.738	1.426	.668
1965	3.054	2.753	1.886	.989	.718	.317
1966	1.778	1.610	1.068	.604	.520	.196
1967	3.165	2.823	2.322	1.546	1.307	.504
1968	.915	.820	.715	.472	.361	.193
1969	.919	.820	.587	.415	.398	.149
1970	2.423	2.208	1.880	1.593	1.394	.557
1971	1.321	1.191	.800	.565	.523	.273
1972	.900	.806	.614	.390	.303	.128
1973	1.142	1.029	.835	.553	.517	.282

1974	1.477	1.323	1.136	.633	.489	.317
1975	2.934	2.611	2.096	1.448	1.227	.396
1976	3.754	3.342	2.276	1.514	1.356	.537
1977	1.123	1.003	.740	.673	.583	.258
1978	.831	.745	.607	.450	.360	.167
1979	10.150	9.284	6.797	4.354	3.519	1.219
1980	.895	.802	.658	.466	.357	.165
1981	4.894	4.447	2.876	1.536	1.173	.354
1982	7.295	6.536	4.657	4.034	3.140	1.037
1983	.827	.738	.573	.375	.366	.218

SORTED FOR PLOTTING
------ --- --------

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	10.150	9.284	6.797	4.354	3.519	1.219
.095	7.295	6.536	4.657	4.034	3.140	1.037
.143	4.894	4.447	2.876	1.738	1.426	.668
.190	3.754	3.342	2.322	1.593	1.394	.557
.238	3.262	2.986	2.276	1.546	1.356	.537
.286	3.165	2.823	2.276	1.536	1.307	.504
.333	3.054	2.753	2.096	1.514	1.227	.396
.381	2.934	2.611	1.886	1.448	1.173	.354
.429	2.423	2.208	1.880	.989	.718	.317
.476	1.778	1.610	1.136	.673	.583	.317
.524	1.477	1.323	1.068	.633	.523	.282
.571	1.321	1.191	.835	.604	.520	.273
.619	1.142	1.029	.800	.565	.517	.258
.667	1.123	1.003	.740	.553	.489	.218
.714	.919	.820	.715	.472	.398	.196
.762	.915	.820	.658	.466	.366	.193
.810	.900	.806	.614	.450	.361	.167
.857	.895	.802	.607	.415	.360	.165
.905	.831	.745	.587	.390	.357	.149
.952	.827	.738	.573	.375	.303	.128
1/10	7.055	6.327	4.479	3.804	2.969	1.000

MEAN OF ANNUAL VALUES = .397

STANDARD DEVIATION OF ANNUAL VALUES = .293

UPPER 90% CONFIDENCE LIMIT ON MEAN = .495

MB46136I - PRZM Input File for MSPOND (C:\hetrick\przm\przm3\przm312\MB136\M136.inp)

```
*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: MB46136-Fipronil
Location: Mississippi; Crop: cotton;  MLRA: O-134
   0.76   0.15     0  17.00     1     1
    4
   0.49   0.40   0.75     10   5.80     4   6.00  354.0
    3
    1   0.20  125.00   98.00     3  99  93  92              0.00  120.00
    2   0.20  125.00   98.00     3  94  84  83              0.00  120.00
    3   0.20  125.00   98.00     3  99  83  83              0.00  120.00
    1     3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
    2     3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
    3     3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
    20
 01 564  07 964  220964      1
 01 565  07 965  220965      2
```

01 566 07 966 220966 3
01 567 07 967 220967 1
01 568 07 968 220968 2
01 569 07 969 220969 3
01 570 07 970 220970 1
01 571 07 971 220971 2
01 572 07 972 220972 3
01 573 07 973 220973 1
01 574 07 974 220974 2
01 575 07 975 220975 3
01 576 07 976 220976 1
01 577 07 977 220977 2
01 578 07 978 220978 3
01 579 07 979 220979 1
01 580 07 980 220980 2
01 581 07 981 220981 3
01 582 07 982 220982 1
01 583 07 983 220983 2
Application schedule: 4 apps @ 0.013 kg/ha-(max 24% daily conversion eff.)
80 1 0 0
Chemical: Koc = 4208; AESM t1/2 = 700 days
260564 0 4 0.01 .013 1.00 0.00
020664 0 4 0.01 .013 1.00 0.00
090664 0 4 0.01 .013 1.00 0.00
160664 0 4 0.01 .013 1.00 0.00
260565 0 4 0.01 .013 1.00 0.00
020665 0 4 0.01 .013 1.00 0.00
090665 0 4 0.01 .013 1.00 0.00
160665 0 4 0.01 .013 1.00 0.00
260566 0 4 0.01 .013 1.00 0.00
020666 0 4 0.01 .013 1.00 0.00
090666 0 4 0.01 .013 1.00 0.00
160666 0 4 0.01 .013 1.00 0.00
260567 0 4 0.01 .013 1.00 0.00
020667 0 4 0.01 .013 1.00 0.00
090667 0 4 0.01 .013 1.00 0.00
160667 0 4 0.01 .013 1.00 0.00
260568 0 4 0.01 .013 1.00 0.00
020668 0 4 0.01 .013 1.00 0.00
090668 0 4 0.01 .013 1.00 0.00
160668 0 4 0.01 .013 1.00 0.00
260569 0 4 0.01 .013 1.00 0.00
020669 0 4 0.01 .013 1.00 0.00
090669 0 4 0.01 .013 1.00 0.00
160669 0 4 0.01 .013 1.00 0.00
260570 0 4 0.01 .013 1.00 0.00
020670 0 4 0.01 .013 1.00 0.00
090670 0 4 0.01 .013 1.00 0.00
160670 0 4 0.01 .013 1.00 0.00
260571 0 4 0.01 .013 1.00 0.00
020671 0 4 0.01 .013 1.00 0.00
090671 0 4 0.01 .013 1.00 0.00
160671 0 4 0.01 .013 1.00 0.00
260572 0 4 0.01 .013 1.00 0.00
020672 0 4 0.01 .013 1.00 0.00
090672 0 4 0.01 .013 1.00 0.00
160672 0 4 0.01 .013 1.00 0.00
260573 0 4 0.01 .013 1.00 0.00
020673 0 4 0.01 .013 1.00 0.00
090673 0 4 0.01 .013 1.00 0.00

```
160673  0 4 0.01  .013 1.00 0.00
260574  0 4 0.01  .013 1.00 0.00
020674  0 4 0.01  .013 1.00 0.00
090674  0 4 0.01  .013 1.00 0.00
160674  0 4 0.01  .013 1.00 0.00
260575  0 4 0.01  .013 1.00 0.00
020675  0 4 0.01  .013 1.00 0.00
090675  0 4 0.01  .013 1.00 0.00
160675  0 4 0.01  .013 1.00 0.00
260576  0 4 0.01  .013 1.00 0.00
020676  0 4 0.01  .013 1.00 0.00
090676  0 4 0.01  .013 1.00 0.00
160676  0 4 0.01  .013 1.00 0.00
260577  0 4 0.01  .013 1.00 0.00
020677  0 4 0.01  .013 1.00 0.00
090677  0 4 0.01  .013 1.00 0.00
160677  0 4 0.01  .013 1.00 0.00
260578  0 4 0.01  .013 1.00 0.00
020678  0 4 0.01  .013 1.00 0.00
090678  0 4 0.01  .013 1.00 0.00
160678  0 4 0.01  .013 1.00 0.00
260579  0 4 0.01  .013 1.00 0.00
020679  0 4 0.01  .013 1.00 0.00
090679  0 4 0.01  .013 1.00 0.00
160679  0 4 0.01  .013 1.00 0.00
260580  0 4 0.01  .013 1.00 0.00
020680  0 4 0.01  .013 1.00 0.00
090680  0 4 0.01  .013 1.00 0.00
160680  0 4 0.01  .013 1.00 0.00
260581  0 4 0.01  .013 1.00 0.00
020681  0 4 0.01  .013 1.00 0.00
090681  0 4 0.01  .013 1.00 0.00
160681  0 4 0.01  .013 1.00 0.00
260582  0 4 0.01  .013 1.00 0.00
020682  0 4 0.01  .013 1.00 0.00
090682  0 4 0.01  .013 1.00 0.00
160682  0 4 0.01  .013 1.00 0.00
260583  0 4 0.01  .013 1.00 0.00
020683  0 4 0.01  .013 1.00 0.00
090683  0 4 0.01  .013 1.00 0.00
160683  0 4 0.01  .013 1.00 0.00
  0.00     0
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
  0.00   0.00  0.00
    6
    1  13.00  1.400  0.385  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       0.100  0.385  0.151  2.180  91.73
    2  23.00  1.400  0.370  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.370  0.146  0.490  20.62
    3  33.00  1.400  0.370  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.370  0.146  0.160  6.73
    4  30.00  1.450  0.340  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.340  0.125  0.124  5.22
    5  23.00  1.490  0.335  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
```

```
   1.000  0.335  0.137  0.070  2.94
  6  33.00  1.510  0.343  0.000  0.000  0.000
   9.90E-4 9.90E-4  0.000
   1.000  0.343  0.147  0.060  2.52
  0
WATR   YEAR    10   PEST   YEAR    10   CONC   YEAR    10  1
  1
  1 -----
  7   DAY
PRCP   TSER  0  0
RUNF   TSER  0  0
INFL   TSER  1  1
ESLS   TSER  0  0  1.E3
RFLX   TSER  0  0  1.E5
EFLX   TSER  0  0  1.E5
RZFX   TSER  0  0  1.E5
```

MB461361 - EXAMS Output File for MSPOND (C:\hetrick\przm\przm3\przm312\MB136\M136a.out

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1964	3.181	2.921	2.311	2.048	1.946	1.038
1965	3.257	3.055	2.587	2.257	2.172	1.855
1966	2.851	2.740	2.456	2.271	2.217	2.054
1967	3.223	3.096	2.905	2.775	2.791	2.438
1968	2.975	2.936	2.857	2.798	2.776	2.716
1969	2.955	2.886	2.716	2.591	2.562	2.529
1970	3.621	3.518	3.375	3.218	3.169	2.697
1971	3.709	3.618	3.395	3.236	3.234	3.121
1972	3.208	3.194	3.170	3.138	3.123	2.981
1973	3.320	3.272	3.061	3.015	2.968	2.864
1974	3.495	3.432	3.275	3.227	3.192	3.158
1975	4.495	4.323	4.096	3.785	3.717	3.349
1976	4.763	4.595	4.290	4.127	4.092	3.741
1977	4.416	4.342	4.158	4.074	4.064	3.972
1978	3.959	3.950	3.926	3.910	3.890	3.754
1979	7.084	6.775	6.058	5.576	5.444	4.520
1980	5.233	5.197	5.092	5.039	5.029	4.847
1981	6.662	6.400	5.682	5.179	5.067	4.672
1982	6.791	6.495	6.214	6.004	5.907	5.271
1983	5.922	5.876	5.777	5.740	5.707	5.523

SORTED FOR PLOTTING

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	7.084	6.775	6.214	6.004	5.907	5.523
.095	6.791	6.495	6.058	5.740	5.707	5.271
.143	6.662	6.400	5.777	5.576	5.444	4.847
.190	5.922	5.876	5.682	5.179	5.067	4.672
.238	5.233	5.197	5.092	5.039	5.029	4.520
.286	4.763	4.595	4.290	4.127	4.092	3.972
.333	4.495	4.342	4.158	4.074	4.064	3.754
.381	4.416	4.323	4.096	3.910	3.890	3.741
.429	3.959	3.950	3.926	3.785	3.717	3.349
.476	3.709	3.618	3.395	3.236	3.234	3.158
.524	3.621	3.518	3.375	3.227	3.192	3.121
.571	3.495	3.432	3.275	3.218	3.169	2.981
.619	3.320	3.272	3.170	3.138	3.123	2.864
.667	3.257	3.194	3.061	3.015	2.968	2.716
.714	3.223	3.096	2.905	2.798	2.791	2.697
.762	3.208	3.055	2.857	2.775	2.776	2.529
.810	3.181	2.936	2.716	2.591	2.562	2.438
.857	2.975	2.921	2.587	2.271	2.217	2.054
.905	2.955	2.886	2.456	2.257	2.172	1.855
.952	2.851	2.740	2.311	2.048	1.946	1.038
1/10	6.778	6.485	6.030	5.724	5.681	5.229

MEAN OF ANNUAL VALUES = 3.355

STANDARD DEVIATION OF ANNUAL VALUES = 1.182

UPPER 90% CONFIDENCE LIMIT ON MEAN = 3.751

MB46136I - PRZM Input File for Index Reservoir (C:\hetrick\przm\przm3\przm312\MB136\M136IR1.inp)

```
*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: MB46136-Fipronil
Location: Mississippi; Crop: cotton;  MLRA: O-134
  0.76   0.15     0  17.00     1     1
   4
  0.49   0.40   0.75  172.80   5.80     4   6.00   600.0
   3
   1   0.20  125.00   98.00     3  99  93  92          0.00  120.00
   2   0.20  125.00   98.00     3  94  84  83          0.00  120.00
   3   0.20  125.00   98.00     3  99  83  83          0.00  120.00
   1    3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
   2    3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
   3    3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
  20
 01 564  07 964  220964    1
 01 565  07 965  220965    2
 01 566  07 966  220966    3
 01 567  07 967  220967    1
 01 568  07 968  220968    2
 01 569  07 969  220969    3
 01 570  07 970  220970    1
 01 571  07 971  220971    2
 01 572  07 972  220972    3
 01 573  07 973  220973    1
 01 574  07 974  220974    2
 01 575  07 975  220975    3
 01 576  07 976  220976    1
 01 577  07 977  220977    2
 01 578  07 978  220978    3
 01 579  07 979  220979    1
 01 580  07 980  220980    2
 01 581  07 981  220981    3
 01 582  07 982  220982    1
 01 583  07 983  220983    2
Application schedule: 4 apps @ 0.013 kg/ha-(24% conversion eff.)
```

```
   80    1    0    0
Chemical: Koc = 4208; AESM t1/2 = 700 days
 260564  0 4 0.01  .013 1.00 0.00
 020664  0 4 0.01  .013 1.00 0.00
 090664  0 4 0.01  .013 1.00 0.00
 160664  0 4 0.01  .013 1.00 0.00
 260565  0 4 0.01  .013 1.00 0.00
 020665  0 4 0.01  .013 1.00 0.00
 090665  0 4 0.01  .013 1.00 0.00
 160665  0 4 0.01  .013 1.00 0.00
 260566  0 4 0.01  .013 1.00 0.00
 020666  0 4 0.01  .013 1.00 0.00
 090666  0 4 0.01  .013 1.00 0.00
 160666  0 4 0.01  .013 1.00 0.00
 260567  0 4 0.01  .013 1.00 0.00
 020667  0 4 0.01  .013 1.00 0.00
 090667  0 4 0.01  .013 1.00 0.00
 160667  0 4 0.01  .013 1.00 0.00
 260568  0 4 0.01  .013 1.00 0.00
 020668  0 4 0.01  .013 1.00 0.00
 090668  0 4 0.01  .013 1.00 0.00
 160668  0 4 0.01  .013 1.00 0.00
 260569  0 4 0.01  .013 1.00 0.00
 020669  0 4 0.01  .013 1.00 0.00
 090669  0 4 0.01  .013 1.00 0.00
 160669  0 4 0.01  .013 1.00 0.00
 260570  0 4 0.01  .013 1.00 0.00
 020670  0 4 0.01  .013 1.00 0.00
 090670  0 4 0.01  .013 1.00 0.00
 160670  0 4 0.01  .013 1.00 0.00
 260571  0 4 0.01  .013 1.00 0.00
 020671  0 4 0.01  .013 1.00 0.00
 090671  0 4 0.01  .013 1.00 0.00
 160671  0 4 0.01  .013 1.00 0.00
 260572  0 4 0.01  .013 1.00 0.00
 020672  0 4 0.01  .013 1.00 0.00
 090672  0 4 0.01  .013 1.00 0.00
 160672  0 4 0.01  .013 1.00 0.00
 260573  0 4 0.01  .013 1.00 0.00
 020673  0 4 0.01  .013 1.00 0.00
 090673  0 4 0.01  .013 1.00 0.00
 160673  0 4 0.01  .013 1.00 0.00
 260574  0 4 0.01  .013 1.00 0.00
 020674  0 4 0.01  .013 1.00 0.00
 090674  0 4 0.01  .013 1.00 0.00
 160674  0 4 0.01  .013 1.00 0.00
 260575  0 4 0.01  .013 1.00 0.00
 020675  0 4 0.01  .013 1.00 0.00
 090675  0 4 0.01  .013 1.00 0.00
 160675  0 4 0.01  .013 1.00 0.00
 260576  0 4 0.01  .013 1.00 0.00
 020676  0 4 0.01  .013 1.00 0.00
 090676  0 4 0.01  .013 1.00 0.00
 160676  0 4 0.01  .013 1.00 0.00
 260577  0 4 0.01  .013 1.00 0.00
 020677  0 4 0.01  .013 1.00 0.00
 090677  0 4 0.01  .013 1.00 0.00
 160677  0 4 0.01  .013 1.00 0.00
 260578  0 4 0.01  .013 1.00 0.00
 020678  0 4 0.01  .013 1.00 0.00
```

```
090678  0 4 0.01  .013 1.00 0.00
160678  0 4 0.01  .013 1.00 0.00
260579  0 4 0.01  .013 1.00 0.00
020679  0 4 0.01  .013 1.00 0.00
090679  0 4 0.01  .013 1.00 0.00
160679  0 4 0.01  .013 1.00 0.00
260580  0 4 0.01  .013 1.00 0.00
020680  0 4 0.01  .013 1.00 0.00
090680  0 4 0.01  .013 1.00 0.00
160680  0 4 0.01  .013 1.00 0.00
260581  0 4 0.01  .013 1.00 0.00
020681  0 4 0.01  .013 1.00 0.00
090681  0 4 0.01  .013 1.00 0.00
160681  0 4 0.01  .013 1.00 0.00
260582  0 4 0.01  .013 1.00 0.00
020682  0 4 0.01  .013 1.00 0.00
090682  0 4 0.01  .013 1.00 0.00
160682  0 4 0.01  .013 1.00 0.00
260583  0 4 0.01  .013 1.00 0.00
020683  0 4 0.01  .013 1.00 0.00
090683  0 4 0.01  .013 1.00 0.00
160683  0 4 0.01  .013 1.00 0.00
  0.00      0
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
  0.00   0.00   0.00
    6
    1  13.00   1.400   0.385   0.000   0.000   0.000
      9.90E-4 9.90E-4   0.000
        0.100   0.385   0.151   2.180   91.73
    2  23.00   1.400   0.370   0.000   0.000   0.000
      9.90E-4 9.90E-4   0.000
        1.000   0.370   0.146   0.490   20.62
    3  33.00   1.400   0.370   0.000   0.000   0.000
      9.90E-4 9.90E-4   0.000
        1.000   0.370   0.146   0.160   6.73
    4  30.00   1.450   0.340   0.000   0.000   0.000
      9.90E-4 9.90E-4   0.000
        1.000   0.340   0.125   0.124   5.22
    5  23.00   1.490   0.335   0.000   0.000   0.000
      9.90E-4 9.90E-4   0.000
        1.000   0.335   0.137   0.070   2.94
    6  33.00   1.510   0.343   0.000   0.000   0.000
      9.90E-4 9.90E-4   0.000
        1.000   0.343   0.147   0.060   2.52
    0
  WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   1
    1
    1  -----
    7   DAY
  PRCP    TSER   0   0
  RUNF    TSER   0   0
  INFL    TSER   1   1
  ESLS    TSER   0   0   1.E3
  RFLX    TSER   0   0   1.E5
  EFLX    TSER   0   0   1.E5
  RZFX    TSER   0   0   1.E5
```

MB461361 - EXAMS Output File for Index Reservoir (C:\hetrick\przm\przm3\przm312\MB136\M136IR1.out)

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1964	9.206	8.932	8.146	7.212	6.444	2.712
1965	5.253	5.092	4.515	3.597	3.125	2.060
1966	3.574	3.496	3.154	2.631	2.345	1.727
1967	4.971	4.815	4.482	4.021	3.923	2.342
1968	3.016	2.951	2.758	2.481	2.294	1.798
1969	2.299	2.239	2.019	1.667	1.509	1.240
1970	5.359	5.185	4.807	4.248	3.965	2.057
1971	3.368	3.276	2.934	2.453	2.461	2.123
1972	2.016	1.979	1.919	1.733	1.634	1.256
1973	2.760	2.706	2.238	2.019	1.919	1.440
1974	3.250	3.187	3.057	2.884	2.656	1.987
1975	5.566	5.435	5.006	4.107	3.631	2.183
1976	5.119	4.960	4.485	3.989	4.049	2.494
1977	3.458	3.371	3.050	2.743	2.658	2.240
1978	2.064	2.034	1.933	1.835	1.742	1.526

1979	11.240	10.980	10.130	8.675	7.781	4.092
1980	3.507	3.446	3.324	3.149	3.039	2.448
1981	7.074	6.929	6.105	4.768	4.191	2.377
1982	9.328	9.030	8.343	7.384	6.953	3.852
1983	4.783	4.678	4.339	3.998	3.738	2.873

SORTED FOR PLOTTING
------ --- --------

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	11.240	10.980	10.130	8.675	7.781	4.092
.095	9.328	9.030	8.343	7.384	6.953	3.852
.143	9.206	8.932	8.146	7.212	6.444	2.873
.190	7.074	6.929	6.105	4.768	4.191	2.712
.238	5.566	5.435	5.006	4.248	4.049	2.494
.286	5.359	5.185	4.807	4.107	3.965	2.448
.333	5.253	5.092	4.515	4.021	3.923	2.377
.381	5.119	4.960	4.485	3.998	3.738	2.342
.429	4.971	4.815	4.482	3.989	3.631	2.240
.476	4.783	4.678	4.339	3.597	3.125	2.183
.524	3.574	3.496	3.324	3.149	3.039	2.123
.571	3.507	3.446	3.154	2.884	2.658	2.060
.619	3.458	3.371	3.057	2.743	2.656	2.057
.667	3.368	3.276	3.050	2.631	2.461	1.987
.714	3.250	3.187	2.934	2.481	2.345	1.798
.762	3.016	2.951	2.758	2.453	2.294	1.727
.810	2.760	2.706	2.238	2.019	1.919	1.526
.857	2.299	2.239	2.019	1.835	1.742	1.440
.905	2.064	2.034	1.933	1.733	1.634	1.256
.952	2.016	1.979	1.919	1.667	1.509	1.240
1/10	9.316	9.020	8.323	7.367	6.902	3.754

MEAN OF ANNUAL VALUES = 2.241

STANDARD DEVIATION OF ANNUAL VALUES = .744

UPPER 90% CONFIDENCE LIMIT ON MEAN = 2.490

MB46513 - PRZM Input File for MSPOND (C:\hetrick\przm\przm3\przm312\MB46513\M513.inp)

*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: MB46136-Fipronil
Location: Mississippi; Crop: cotton; MLRA: O-134

```
   0.76   0.15     0  17.00     1     1
     4
   0.49   0.40   0.75    10   5.80     4   6.00  354.0
     3
     1  0.20  125.00  98.00     3  99  93  92          0.00  120.00
     2  0.20  125.00  98.00     3  94  84  83          0.00  120.00
     3  0.20  125.00  98.00     3  99  83  83          0.00  120.00
     1     3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
    2     3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
    3     3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
   20
  01 564  07 964  220964     1
  01 565  07 965  220965     2
  01 566  07 966  220966     3
  01 567  07 967  220967     1
  01 568  07 968  220968     2
  01 569  07 969  220969     3
  01 570  07 970  220970     1
  01 571  07 971  220971     2
  01 572  07 972  220972     3
  01 573  07 973  220973     1
  01 574  07 974  220974     2
  01 575  07 975  220975     3
  01 576  07 976  220976     1
  01 577  07 977  220977     2
  01 578  07 978  220978     3
  01 579  07 979  220979     1
  01 580  07 980  220980     2
  01 581  07 981  220981     3
  01 582  07 982  220982     1
  01 583  07 983  220983     2
Application schedule: 4 apps @ 0.013 kg/ha-(24% conversion eff.)
   80     1     0     0
Chemical: Koc = 4208; AESM t1/2 = 700 days
  260564  0 4 0.01  .024 1.00 0.00
  020664  0 4 0.01  .024 1.00 0.00
  090664  0 4 0.01  .024 1.00 0.00
  160664  0 4 0.01  .024 1.00 0.00
  260565  0 4 0.01  .024 1.00 0.00
  020665  0 4 0.01  .024 1.00 0.00
  090665  0 4 0.01  .024 1.00 0.00
  160665  0 4 0.01  .024 1.00 0.00
  260566  0 4 0.01  .024 1.00 0.00
  020666  0 4 0.01  .024 1.00 0.00
  090666  0 4 0.01  .024 1.00 0.00
  160666  0 4 0.01  .024 1.00 0.00
  260567  0 4 0.01  .024 1.00 0.00
  020667  0 4 0.01  .024 1.00 0.00
  090667  0 4 0.01  .024 1.00 0.00
  160667  0 4 0.01  .024 1.00 0.00
  260568  0 4 0.01  .024 1.00 0.00
```

020668	0 4	0.01	.024	1.00	0.00
090668	0 4	0.01	.024	1.00	0.00
160668	0 4	0.01	.024	1.00	0.00
260569	0 4	0.01	.024	1.00	0.00
020669	0 4	0.01	.024	1.00	0.00
090669	0 4	0.01	.024	1.00	0.00
160669	0 4	0.01	.024	1.00	0.00
260570	0 4	0.01	.024	1.00	0.00
020670	0 4	0.01	.024	1.00	0.00
090670	0 4	0.01	.024	1.00	0.00
160670	0 4	0.01	.024	1.00	0.00
260571	0 4	0.01	.024	1.00	0.00
020671	0 4	0.01	.024	1.00	0.00
090671	0 4	0.01	.024	1.00	0.00
160671	0 4	0.01	.024	1.00	0.00
260572	0 4	0.01	.024	1.00	0.00
020672	0 4	0.01	.024	1.00	0.00
090672	0 4	0.01	.024	1.00	0.00
160672	0 4	0.01	.024	1.00	0.00
260573	0 4	0.01	.024	1.00	0.00
020673	0 4	0.01	.024	1.00	0.00
090673	0 4	0.01	.024	1.00	0.00
160673	0 4	0.01	.024	1.00	0.00
260574	0 4	0.01	.024	1.00	0.00
020674	0 4	0.01	.024	1.00	0.00
090674	0 4	0.01	.024	1.00	0.00
160674	0 4	0.01	.024	1.00	0.00
260575	0 4	0.01	.024	1.00	0.00
020675	0 4	0.01	.024	1.00	0.00
090675	0 4	0.01	.024	1.00	0.00
160675	0 4	0.01	.024	1.00	0.00
260576	0 4	0.01	.024	1.00	0.00
020676	0 4	0.01	.024	1.00	0.00
090676	0 4	0.01	.024	1.00	0.00
160676	0 4	0.01	.024	1.00	0.00
260577	0 4	0.01	.024	1.00	0.00
020677	0 4	0.01	.024	1.00	0.00
090677	0 4	0.01	.024	1.00	0.00
160677	0 4	0.01	.024	1.00	0.00
260578	0 4	0.01	.024	1.00	0.00
020678	0 4	0.01	.024	1.00	0.00
090678	0 4	0.01	.024	1.00	0.00
160678	0 4	0.01	.024	1.00	0.00
260579	0 4	0.01	.024	1.00	0.00
020679	0 4	0.01	.024	1.00	0.00
090679	0 4	0.01	.024	1.00	0.00
160679	0 4	0.01	.024	1.00	0.00
260580	0 4	0.01	.024	1.00	0.00
020680	0 4	0.01	.024	1.00	0.00
090680	0 4	0.01	.024	1.00	0.00
160680	0 4	0.01	.024	1.00	0.00
260581	0 4	0.01	.024	1.00	0.00
020681	0 4	0.01	.024	1.00	0.00
090681	0 4	0.01	.024	1.00	0.00
160681	0 4	0.01	.024	1.00	0.00
260582	0 4	0.01	.024	1.00	0.00
020682	0 4	0.01	.024	1.00	0.00
090682	0 4	0.01	.024	1.00	0.00
160682	0 4	0.01	.024	1.00	0.00
260583	0 4	0.01	.024	1.00	0.00

```
 020683  0 4 0.01  .024 1.00 0.00
 090683  0 4 0.01  .024 1.00 0.00
 160683  0 4 0.01  .024 1.00 0.00
  0.00      0
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
  0.00   0.00  0.00
    6
    1  13.00  1.400  0.385  0.000  0.000  0.000
      1.05E-3 1.05E-3  0.000
        0.100  0.385  0.151  2.180  28.12
    2  23.00  1.400  0.370  0.000  0.000  0.000
      1.05E-3 1.05E-3  0.000
        1.000  0.370  0.146  0.490  6.32
    3  33.00  1.400  0.370  0.000  0.000  0.000
      1.05E-3 1.05E-3  0.000
        1.000  0.370  0.146  0.160  2.06
    4  30.00  1.450  0.340  0.000  0.000  0.000
      1.05E-3 1.05E-3  0.000
        1.000  0.340  0.125  0.124  1.60
    5  23.00  1.490  0.335  0.000  0.000  0.000
      1.05E-3 1.05E-3  0.000
        1.000  0.335  0.137  0.070  0.90
    6  33.00  1.510  0.343  0.000  0.000  0.000
      1.05E-3 1.05E-3  0.000
        1.000  0.343  0.147  0.060  0.77
    0
  WATR   YEAR    10   PEST   YEAR    10   CONC   YEAR    10  1
    1
    1 -----
    7   DAY
  PRCP   TSER  0  0
  RUNF   TSER  0  0
  INFL   TSER  1  1
  ESLS   TSER  0  0  1.E3
  RFLX   TSER  0  0  1.E5
  EFLX   TSER  0  0  1.E5
  RZFX   TSER  0  0  1.E5
```

MB46513 - EXAMS Output File for MSPOND (C:\hetrick\przm\przm3\przm312\MB46513\M513a.out)

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1964	5.464	5.366	5.042	4.727	4.774	2.353
1965	6.898	6.787	6.432	5.986	5.807	5.062
1966	6.382	6.341	6.171	5.974	5.887	5.593
1967	8.641	8.597	8.431	8.107	8.076	6.928
1968	8.655	8.618	8.516	8.400	8.338	8.214
1969	8.222	8.185	8.057	7.956	7.931	7.823
1970	10.950	10.830	10.560	10.200	10.050	8.493
1971	10.780	10.710	10.500	10.220	10.190	9.931
1972	10.280	10.260	10.220	10.140	10.100	9.711
1973	10.620	10.580	10.160	9.968	9.822	9.479
1974	10.990	10.950	10.820	10.730	10.660	10.560
1975	12.550	12.480	12.260	11.890	11.750	11.010
1976	13.590	13.530	13.380	13.170	13.050	12.100
1977	13.540	13.490	13.340	13.180	13.140	12.990
1978	13.110	13.090	13.040	13.000	12.940	12.560
1979	19.300	19.130	18.680	18.120	17.910	15.130
1980	17.450	17.420	17.340	17.260	17.240	16.750
1981	18.730	18.640	18.190	17.550	17.300	16.340
1982	21.800	21.620	21.160	20.680	20.380	18.480
1983	20.990	20.920	20.740	20.610	20.500	19.740

SORTED FOR PLOTTING

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	21.800	21.620	21.160	20.680	20.500	19.740
.095	20.990	20.920	20.740	20.610	20.380	18.480
.143	19.300	19.130	18.680	18.120	17.910	16.750
.190	18.730	18.640	18.190	17.550	17.300	16.340
.238	17.450	17.420	17.340	17.260	17.240	15.130
.286	13.590	13.530	13.380	13.180	13.140	12.990
.333	13.540	13.490	13.340	13.170	13.050	12.560

.381	13.110	13.090	13.040	13.000	12.940	12.100
.429	12.550	12.480	12.260	11.890	11.750	11.010
.476	10.990	10.950	10.820	10.730	10.660	10.560
.524	10.950	10.830	10.560	10.220	10.190	9.931
.571	10.780	10.710	10.500	10.200	10.100	9.711
.619	10.620	10.580	10.220	10.140	10.050	9.479
.667	10.280	10.260	10.160	9.968	9.822	8.493
.714	8.655	8.618	8.516	8.400	8.338	8.214
.762	8.641	8.597	8.431	8.107	8.076	7.823
.810	8.222	8.185	8.057	7.956	7.931	6.928
.857	6.898	6.787	6.432	5.986	5.887	5.593
.905	6.382	6.341	6.171	5.974	5.807	5.062
.952	5.464	5.366	5.042	4.727	4.774	2.353
1/10	20.821	20.741	20.534	20.361	20.133	18.307

MEAN OF ANNUAL VALUES = 10.962

STANDARD DEVIATION OF ANNUAL VALUES = 4.610

UPPER 90% CONFIDENCE LIMIT ON MEAN = 12.507

MB46513 - PRZM Input File for Index Reservoir (C:\hetrick\przm\przm3\przm312\MB46513\M513ir1.inp)

```
*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: MB46136-Fipronil
Location: Mississippi; Crop: cotton; MLRA: O-134
   0.76  0.15    0  17.00    1    1
   4
   0.49  0.40  0.75 172.80  5.80    4  6.00  600.0
   3
   1  0.20 125.00  98.00    3  99  93  92        0.00  120.00
   2  0.20 125.00  98.00    3  94  84  83        0.00  120.00
   3  0.20 125.00  98.00    3  99  83  83        0.00  120.00
   1    3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
   2    3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
   3    3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
   20
```

```
 01 564  07 964  220964      1
 01 565  07 965  220965      2
 01 566  07 966  220966      3
 01 567  07 967  220967      1
 01 568  07 968  220968      2
 01 569  07 969  220969      3
 01 570  07 970  220970      1
 01 571  07 971  220971      2
 01 572  07 972  220972      3
 01 573  07 973  220973      1
 01 574  07 974  220974      2
 01 575  07 975  220975      3
 01 576  07 976  220976      1
 01 577  07 977  220977      2
 01 578  07 978  220978      3
 01 579  07 979  220979      1
 01 580  07 980  220980      2
 01 581  07 981  220981      3
 01 582  07 982  220982      1
 01 583  07 983  220983      2
Application schedule: 4 apps @ 0.013 kg/ha-(24% conversion eff.)
    80      1      0      0
Chemical: Koc = 4208; AESM t1/2 = 700 days
 260564  0 4 0.01  .024 1.00 0.00
 020664  0 4 0.01  .024 1.00 0.00
 090664  0 4 0.01  .024 1.00 0.00
 160664  0 4 0.01  .024 1.00 0.00
 260565  0 4 0.01  .024 1.00 0.00
 020665  0 4 0.01  .024 1.00 0.00
 090665  0 4 0.01  .024 1.00 0.00
 160665  0 4 0.01  .024 1.00 0.00
 260566  0 4 0.01  .024 1.00 0.00
 020666  0 4 0.01  .024 1.00 0.00
 090666  0 4 0.01  .024 1.00 0.00
 160666  0 4 0.01  .024 1.00 0.00
 260567  0 4 0.01  .024 1.00 0.00
 020667  0 4 0.01  .024 1.00 0.00
 090667  0 4 0.01  .024 1.00 0.00
 160667  0 4 0.01  .024 1.00 0.00
 260568  0 4 0.01  .024 1.00 0.00
 020668  0 4 0.01  .024 1.00 0.00
 090668  0 4 0.01  .024 1.00 0.00
 160668  0 4 0.01  .024 1.00 0.00
 260569  0 4 0.01  .024 1.00 0.00
 020669  0 4 0.01  .024 1.00 0.00
 090669  0 4 0.01  .024 1.00 0.00
 160669  0 4 0.01  .024 1.00 0.00
 260570  0 4 0.01  .024 1.00 0.00
 020670  0 4 0.01  .024 1.00 0.00
 090670  0 4 0.01  .024 1.00 0.00
 160670  0 4 0.01  .024 1.00 0.00
 260571  0 4 0.01  .024 1.00 0.00
 020671  0 4 0.01  .024 1.00 0.00
 090671  0 4 0.01  .024 1.00 0.00
 160671  0 4 0.01  .024 1.00 0.00
 260572  0 4 0.01  .024 1.00 0.00
 020672  0 4 0.01  .024 1.00 0.00
 090672  0 4 0.01  .024 1.00 0.00
 160672  0 4 0.01  .024 1.00 0.00
 260573  0 4 0.01  .024 1.00 0.00
```

```
020673  0 4 0.01  .024 1.00 0.00
090673  0 4 0.01  .024 1.00 0.00
160673  0 4 0.01  .024 1.00 0.00
260574  0 4 0.01  .024 1.00 0.00
020674  0 4 0.01  .024 1.00 0.00
090674  0 4 0.01  .024 1.00 0.00
160674  0 4 0.01  .024 1.00 0.00
260575  0 4 0.01  .024 1.00 0.00
020675  0 4 0.01  .024 1.00 0.00
090675  0 4 0.01  .024 1.00 0.00
160675  0 4 0.01  .024 1.00 0.00
260576  0 4 0.01  .024 1.00 0.00
020676  0 4 0.01  .024 1.00 0.00
090676  0 4 0.01  .024 1.00 0.00
160676  0 4 0.01  .024 1.00 0.00
260577  0 4 0.01  .024 1.00 0.00
020677  0 4 0.01  .024 1.00 0.00
090677  0 4 0.01  .024 1.00 0.00
160677  0 4 0.01  .024 1.00 0.00
260578  0 4 0.01  .024 1.00 0.00
020678  0 4 0.01  .024 1.00 0.00
090678  0 4 0.01  .024 1.00 0.00
160678  0 4 0.01  .024 1.00 0.00
260579  0 4 0.01  .024 1.00 0.00
020679  0 4 0.01  .024 1.00 0.00
090679  0 4 0.01  .024 1.00 0.00
160679  0 4 0.01  .024 1.00 0.00
260580  0 4 0.01  .024 1.00 0.00
020680  0 4 0.01  .024 1.00 0.00
090680  0 4 0.01  .024 1.00 0.00
160680  0 4 0.01  .024 1.00 0.00
260581  0 4 0.01  .024 1.00 0.00
020681  0 4 0.01  .024 1.00 0.00
090681  0 4 0.01  .024 1.00 0.00
160681  0 4 0.01  .024 1.00 0.00
260582  0 4 0.01  .024 1.00 0.00
020682  0 4 0.01  .024 1.00 0.00
090682  0 4 0.01  .024 1.00 0.00
160682  0 4 0.01  .024 1.00 0.00
260583  0 4 0.01  .024 1.00 0.00
020683  0 4 0.01  .024 1.00 0.00
090683  0 4 0.01  .024 1.00 0.00
160683  0 4 0.01  .024 1.00 0.00
  0.00     0
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
   0.00   0.00  0.00
     6
     1  13.00  1.400  0.385  0.000  0.000  0.000
       1.05E-3 1.05E-3  0.000
         0.100  0.385  0.151  2.180  28.12
     2  23.00  1.400  0.370  0.000  0.000  0.000
       1.05E-3 1.05E-3  0.000
         1.000  0.370  0.146  0.490  6.32
     3  33.00  1.400  0.370  0.000  0.000  0.000
       1.05E-3 1.05E-3  0.000
         1.000  0.370  0.146  0.160  2.06
     4  30.00  1.450  0.340  0.000  0.000  0.000
       1.05E-3 1.05E-3  0.000
         1.000  0.340  0.125  0.124  1.60
```

```
  5  23.00  1.490  0.335  0.000  0.000  0.000
   1.05E-3 1.05E-3  0.000
    1.000  0.335  0.137  0.070  0.90
  6  33.00  1.510  0.343  0.000  0.000  0.000
   1.05E-3 1.05E-3  0.000
    1.000  0.343  0.147  0.060  0.77
  0
WATR   YEAR    10   PEST   YEAR    10   CONC   YEAR    10  1
  1
  1 -----
  7   DAY
PRCP   TSER  0  0
RUNF   TSER  0  0
INFL   TSER  1  1
ESLS   TSER  0  0  1.E3
RFLX   TSER  0  0  1.E5
EFLX   TSER  0  0  1.E5
RZFX   TSER  0  0  1.E5
```

MB46513 - EXAMS Output File for Index Reservoir (C:\hetrick\przm\przm3\przm312\MB46513\m513ir1.out)

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1964	9.878	9.674	9.059	8.486	7.908	4.010
1965	6.997	6.818	6.173	5.009	4.363	3.231
1966	3.723	3.666	3.363	2.876	2.566	1.882
1967	7.998	7.791	7.358	6.668	6.450	3.380
1968	4.755	4.647	4.385	3.822	3.443	2.313
1969	2.459	2.401	2.180	1.790	1.597	1.243
1970	9.533	9.275	8.593	7.523	6.895	3.136
1971	4.749	4.632	4.321	3.779	3.635	2.926
1972	2.741	2.683	2.590	2.228	2.017	1.303
1973	4.676	4.598	3.610	3.200	2.911	1.732
1974	5.261	5.166	4.953	4.722	4.364	2.923
1975	7.063	6.910	6.397	5.471	4.921	2.814
1976	7.220	7.077	6.698	5.898	5.945	3.363
1977	4.180	4.083	3.711	3.348	3.235	2.859
1978	2.758	2.695	2.466	2.240	2.049	1.623
1979	18.270	17.920	16.980	15.120	13.830	6.829
1980	6.070	5.941	5.715	5.282	4.917	3.253
1981	9.426	9.257	8.368	6.750	5.955	3.013
1982	15.820	15.400	14.250	12.850	12.130	6.322
1983	8.492	8.298	7.627	6.750	6.120	3.739

SORTED FOR PLOTTING

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	18.270	17.920	16.980	15.120	13.830	6.829
.095	15.820	15.400	14.250	12.850	12.130	6.322
.143	9.878	9.674	9.059	8.486	7.908	4.010
.190	9.533	9.275	8.593	7.523	6.895	3.739
.238	9.426	9.257	8.368	6.750	6.450	3.380
.286	8.492	8.298	7.627	6.750	6.120	3.363
.333	7.998	7.791	7.358	6.668	5.955	3.253
.381	7.220	7.077	6.698	5.898	5.945	3.231
.429	7.063	6.910	6.397	5.471	4.921	3.136
.476	6.997	6.818	6.173	5.282	4.917	3.013
.524	6.070	5.941	5.715	5.009	4.364	2.926
.571	5.261	5.166	4.953	4.722	4.363	2.923
.619	4.755	4.647	4.385	3.822	3.635	2.859
.667	4.749	4.632	4.321	3.779	3.443	2.814
.714	4.676	4.598	3.711	3.348	3.235	2.313
.762	4.180	4.083	3.610	3.200	2.911	1.882
.810	3.723	3.666	3.363	2.876	2.566	1.732
.857	2.758	2.695	2.590	2.240	2.049	1.623
.905	2.741	2.683	2.466	2.228	2.017	1.303
.952	2.459	2.401	2.180	1.790	1.597	1.243
1/10	15.226	14.827	13.731	12.414	11.708	6.091

MEAN OF ANNUAL VALUES = 3.095

STANDARD DEVIATION OF ANNUAL VALUES = 1.428

UPPER 90% CONFIDENCE LIMIT ON MEAN = 3.573

MB46950 - PRZM Input File for MSPOND (C:\hetrick\przm\przm3\przm312\MB950\m950.inp)

```
*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: MB45950-Fipronil
Location: Mississippi; Crop: cotton; MLRA: O-134
  0.76   0.15     0  17.00     1     1
    4
  0.49   0.40   0.75    10   5.80     4   6.00  354.0
    3
    1   0.20  125.00  98.00    3  99  93  92          0.00  120.00
    2   0.20  125.00  98.00    3  94  84  83          0.00  120.00
    3   0.20  125.00  98.00    3  99  83  83          0.00  120.00
    1     3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
    2     3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
    3     3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
   20
 01 564  07 964  220964    1
 01 565  07 965  220965    2
 01 566  07 966  220966    3
 01 567  07 967  220967    1
 01 568  07 968  220968    2
 01 569  07 969  220969    3
 01 570  07 970  220970    1
 01 571  07 971  220971    2
 01 572  07 972  220972    3
 01 573  07 973  220973    1
 01 574  07 974  220974    2
 01 575  07 975  220975    3
 01 576  07 976  220976    1
 01 577  07 977  220977    2
 01 578  07 978  220978    3
 01 579  07 979  220979    1
 01 580  07 980  220980    2
 01 581  07 981  220981    3
 01 582  07 982  220982    1
 01 583  07 983  220983    2
Application schedule: 4 apps @ 0.003 kg/ha-(~5% conversion eff.)
```

80 1 0 0
Chemical: Koc = 2719; AESM t1/2 = 700 days

260564	0 4	0.01	.003	1.00	0.00	
020664	0 4	0.01	.003	1.00	0.00	
090664	0 4	0.01	.003	1.00	0.00	
160664	0 4	0.01	.003	1.00	0.00	
260565	0 4	0.01	.003	1.00	0.00	
020665	0 4	0.01	.003	1.00	0.00	
090665	0 4	0.01	.003	1.00	0.00	
160665	0 4	0.01	.003	1.00	0.00	
260566	0 4	0.01	.003	1.00	0.00	
020666	0 4	0.01	.003	1.00	0.00	
090666	0 4	0.01	.003	1.00	0.00	
160666	0 4	0.01	.003	1.00	0.00	
260567	0 4	0.01	.003	1.00	0.00	
020667	0 4	0.01	.003	1.00	0.00	
090667	0 4	0.01	.003	1.00	0.00	
160667	0 4	0.01	.003	1.00	0.00	
260568	0 4	0.01	.003	1.00	0.00	
020668	0 4	0.01	.003	1.00	0.00	
090668	0 4	0.01	.003	1.00	0.00	
160668	0 4	0.01	.003	1.00	0.00	
260569	0 4	0.01	.003	1.00	0.00	
020669	0 4	0.01	.003	1.00	0.00	
090669	0 4	0.01	.003	1.00	0.00	
160669	0 4	0.01	.003	1.00	0.00	
260570	0 4	0.01	.003	1.00	0.00	
020670	0 4	0.01	.003	1.00	0.00	
090670	0 4	0.01	.003	1.00	0.00	
160670	0 4	0.01	.003	1.00	0.00	
260571	0 4	0.01	.003	1.00	0.00	
020671	0 4	0.01	.003	1.00	0.00	
090671	0 4	0.01	.003	1.00	0.00	
160671	0 4	0.01	.003	1.00	0.00	
260572	0 4	0.01	.003	1.00	0.00	
020672	0 4	0.01	.003	1.00	0.00	
090672	0 4	0.01	.003	1.00	0.00	
160672	0 4	0.01	.003	1.00	0.00	
260573	0 4	0.01	.003	1.00	0.00	
020673	0 4	0.01	.003	1.00	0.00	
090673	0 4	0.01	.003	1.00	0.00	
160673	0 4	0.01	.003	1.00	0.00	
260574	0 4	0.01	.003	1.00	0.00	
020674	0 4	0.01	.003	1.00	0.00	
090674	0 4	0.01	.003	1.00	0.00	
160674	0 4	0.01	.003	1.00	0.00	
260575	0 4	0.01	.003	1.00	0.00	
020675	0 4	0.01	.003	1.00	0.00	
090675	0 4	0.01	.003	1.00	0.00	
160675	0 4	0.01	.003	1.00	0.00	
260576	0 4	0.01	.003	1.00	0.00	
020676	0 4	0.01	.003	1.00	0.00	
090676	0 4	0.01	.003	1.00	0.00	
160676	0 4	0.01	.003	1.00	0.00	
260577	0 4	0.01	.003	1.00	0.00	
020677	0 4	0.01	.003	1.00	0.00	
090677	0 4	0.01	.003	1.00	0.00	
160677	0 4	0.01	.003	1.00	0.00	
260578	0 4	0.01	.003	1.00	0.00	
020678	0 4	0.01	.003	1.00	0.00	

```
090678  0 4 0.01  .003 1.00 0.00
160678  0 4 0.01  .003 1.00 0.00
260579  0 4 0.01  .003 1.00 0.00
020679  0 4 0.01  .003 1.00 0.00
090679  0 4 0.01  .003 1.00 0.00
160679  0 4 0.01  .003 1.00 0.00
260580  0 4 0.01  .003 1.00 0.00
020680  0 4 0.01  .003 1.00 0.00
090680  0 4 0.01  .003 1.00 0.00
160680  0 4 0.01  .003 1.00 0.00
260581  0 4 0.01  .003 1.00 0.00
020681  0 4 0.01  .003 1.00 0.00
090681  0 4 0.01  .003 1.00 0.00
160681  0 4 0.01  .003 1.00 0.00
260582  0 4 0.01  .003 1.00 0.00
020682  0 4 0.01  .003 1.00 0.00
090682  0 4 0.01  .003 1.00 0.00
160682  0 4 0.01  .003 1.00 0.00
260583  0 4 0.01  .003 1.00 0.00
020683  0 4 0.01  .003 1.00 0.00
090683  0 4 0.01  .003 1.00 0.00
160683  0 4 0.01  .003 1.00 0.00
  0.00     0
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
  0.00   0.00  0.00
    6
    1  13.00  1.400  0.385  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       0.100  0.385  0.151  2.180  59.27
    2  23.00  1.400  0.370  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.370  0.146  0.490  13.32
    3  33.00  1.400  0.370  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.370  0.146  0.160  4.39
    4  30.00  1.450  0.340  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.340  0.125  0.124  3.37
    5  23.00  1.490  0.335  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.335  0.137  0.070  1.90
    6  33.00  1.510  0.343  0.000  0.000  0.000
     9.90E-4 9.90E-4  0.000
       1.000  0.343  0.147  0.060  1.63
    0
  WATR   YEAR    10   PEST   YEAR    10   CONC   YEAR    10  1
    1
    1 -----
    7   DAY
  PRCP   TSER  0  0
  RUNF   TSER  0  0
  INFL   TSER  1  1
  ESLS   TSER  0  0  1.E3
  RFLX   TSER  0  0  1.E5
  EFLX   TSER  0  0  1.E5
  RZFX   TSER  0  0  1.E5
```

1977	1.400	1.389	1.358	1.339	1.336	1.312
1978	1.321	1.319	1.314	1.310	1.305	1.274
1979	2.077	2.036	1.914	1.812	1.780	1.517
1980	1.741	1.734	1.715	1.700	1.693	1.650
1981	2.011	1.979	1.867	1.760	1.731	1.623
1982	2.171	2.140	2.083	2.024	2.004	1.824
1983	2.041	2.031	2.006	1.995	1.986	1.934

SORTED FOR PLOTTING
------ --- --------

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	2.171	2.140	2.083	2.024	2.004	1.934
.095	2.077	2.036	2.006	1.995	1.986	1.824
.143	2.041	2.031	1.914	1.812	1.780	1.650
.190	2.011	1.979	1.867	1.760	1.731	1.623
.238	1.741	1.734	1.715	1.700	1.693	1.517
.286	1.435	1.411	1.367	1.339	1.336	1.312
.333	1.400	1.389	1.358	1.334	1.325	1.274
.381	1.321	1.319	1.314	1.310	1.305	1.229
.429	1.319	1.305	1.270	1.211	1.195	1.109
.476	1.118	1.108	1.081	1.066	1.059	1.051
.524	1.111	1.098	1.059	1.023	1.020	.991
.571	1.104	1.084	1.050	1.008	1.005	.971
.619	1.075	1.067	1.018	1.008	.991	.957
.667	1.024	1.021	1.016	1.003	.990	.855
.714	.906	.885	.853	.838	.834	.824
.762	.874	.867	.852	.820	.822	.792
.810	.865	.856	.830	.806	.798	.716
.857	.784	.757	.684	.636	.625	.584
.905	.725	.712	.671	.618	.598	.520
.952	.679	.649	.563	.520	.503	.273
1/10	2.073	2.036	1.997	1.977	1.965	1.807

MEAN OF ANNUAL VALUES = 1.100

STANDARD DEVIATION OF ANNUAL VALUES = .446

UPPER 90% CONFIDENCE LIMIT ON MEAN = 1.250

MB46950 - PRZM Input File for Index Reservoir (C:\hetrick\przm\przm3\przm312\MB950\m950ir1.inp)

```
*** PRZM 3.1 Input data File, MSCOTTN1.inp***
*** Standard Scenario Draft Final April 10, 1998 ***
*** Location: Yazoo County, Mississippi; MLRA: O-134 ***
*** Weather: MET131.MET Jackson, MS ***
*** Manning's N: Assume fallow surface with residues not more than 1 ton/acre ***
*** See MSCOTTN1.wpd for scenario description and metadata ***
*** Modeler must input chemical specific information where all "X's" appear ***
Chemical: MB45950-Fipronil
Location: Mississippi; Crop: cotton; MLRA: O-134
  0.76  0.15     0  17.00     1     1
```

```
    4
  0.49   0.40   0.75  172.80   5.80     4   6.00   600.0
    3
    1   0.20  125.00   98.00     3  99  93  92           0.00  120.00
    2   0.20  125.00   98.00     3  94  84  83           0.00  120.00
    3   0.20  125.00   98.00     3  99  83  83           0.00  120.00
    1     3
0101 2109 2209
0.63 0.16 0.18
0.02 0.02 0.02
    2     3
0105 0709 2209
0.16 0.13 0.13
0.02 0.02 0.02
    3     3
0105 0709 2209
0.16 0.13 0.09
0.02 0.02 0.02
   20
 01 564  07 964  220964     1
 01 565  07 965  220965     2
 01 566  07 966  220966     3
 01 567  07 967  220967     1
 01 568  07 968  220968     2
 01 569  07 969  220969     3
 01 570  07 970  220970     1
 01 571  07 971  220971     2
 01 572  07 972  220972     3
 01 573  07 973  220973     1
 01 574  07 974  220974     2
 01 575  07 975  220975     3
 01 576  07 976  220976     1
 01 577  07 977  220977     2
 01 578  07 978  220978     3
 01 579  07 979  220979     1
 01 580  07 980  220980     2
 01 581  07 981  220981     3
 01 582  07 982  220982     1
 01 583  07 983  220983     2
Application schedule: 4 apps @ 0.003 kg/ha-(~5% conversion eff.)
   80     1     0     0
Chemical: Koc = 2719; AESM t1/2 = 700 days
 260564  0 4 0.01  .003 1.00 0.00
 020664  0 4 0.01  .003 1.00 0.00
 090664  0 4 0.01  .003 1.00 0.00
 160664  0 4 0.01  .003 1.00 0.00
 260565  0 4 0.01  .003 1.00 0.00
 020665  0 4 0.01  .003 1.00 0.00
 090665  0 4 0.01  .003 1.00 0.00
 160665  0 4 0.01  .003 1.00 0.00
 260566  0 4 0.01  .003 1.00 0.00
 020666  0 4 0.01  .003 1.00 0.00
 090666  0 4 0.01  .003 1.00 0.00
 160666  0 4 0.01  .003 1.00 0.00
 260567  0 4 0.01  .003 1.00 0.00
 020667  0 4 0.01  .003 1.00 0.00
 090667  0 4 0.01  .003 1.00 0.00
 160667  0 4 0.01  .003 1.00 0.00
 260568  0 4 0.01  .003 1.00 0.00
 020668  0 4 0.01  .003 1.00 0.00
```

090668	0	4	0.01	.003	1.00	0.00
160668	0	4	0.01	.003	1.00	0.00
260569	0	4	0.01	.003	1.00	0.00
020669	0	4	0.01	.003	1.00	0.00
090669	0	4	0.01	.003	1.00	0.00
160669	0	4	0.01	.003	1.00	0.00
260570	0	4	0.01	.003	1.00	0.00
020670	0	4	0.01	.003	1.00	0.00
090670	0	4	0.01	.003	1.00	0.00
160670	0	4	0.01	.003	1.00	0.00
260571	0	4	0.01	.003	1.00	0.00
020671	0	4	0.01	.003	1.00	0.00
090671	0	4	0.01	.003	1.00	0.00
160671	0	4	0.01	.003	1.00	0.00
260572	0	4	0.01	.003	1.00	0.00
020672	0	4	0.01	.003	1.00	0.00
090672	0	4	0.01	.003	1.00	0.00
160672	0	4	0.01	.003	1.00	0.00
260573	0	4	0.01	.003	1.00	0.00
020673	0	4	0.01	.003	1.00	0.00
090673	0	4	0.01	.003	1.00	0.00
160673	0	4	0.01	.003	1.00	0.00
260574	0	4	0.01	.003	1.00	0.00
020674	0	4	0.01	.003	1.00	0.00
090674	0	4	0.01	.003	1.00	0.00
160674	0	4	0.01	.003	1.00	0.00
260575	0	4	0.01	.003	1.00	0.00
020675	0	4	0.01	.003	1.00	0.00
090675	0	4	0.01	.003	1.00	0.00
160675	0	4	0.01	.003	1.00	0.00
260576	0	4	0.01	.003	1.00	0.00
020676	0	4	0.01	.003	1.00	0.00
090676	0	4	0.01	.003	1.00	0.00
160676	0	4	0.01	.003	1.00	0.00
260577	0	4	0.01	.003	1.00	0.00
020677	0	4	0.01	.003	1.00	0.00
090677	0	4	0.01	.003	1.00	0.00
160677	0	4	0.01	.003	1.00	0.00
260578	0	4	0.01	.003	1.00	0.00
020678	0	4	0.01	.003	1.00	0.00
090678	0	4	0.01	.003	1.00	0.00
160678	0	4	0.01	.003	1.00	0.00
260579	0	4	0.01	.003	1.00	0.00
020679	0	4	0.01	.003	1.00	0.00
090679	0	4	0.01	.003	1.00	0.00
160679	0	4	0.01	.003	1.00	0.00
260580	0	4	0.01	.003	1.00	0.00
020680	0	4	0.01	.003	1.00	0.00
090680	0	4	0.01	.003	1.00	0.00
160680	0	4	0.01	.003	1.00	0.00
260581	0	4	0.01	.003	1.00	0.00
020681	0	4	0.01	.003	1.00	0.00
090681	0	4	0.01	.003	1.00	0.00
160681	0	4	0.01	.003	1.00	0.00
260582	0	4	0.01	.003	1.00	0.00
020682	0	4	0.01	.003	1.00	0.00
090682	0	4	0.01	.003	1.00	0.00
160682	0	4	0.01	.003	1.00	0.00
260583	0	4	0.01	.003	1.00	0.00
020683	0	4	0.01	.003	1.00	0.00

```
 090683  0 4 0.01  .003 1.00 0.00
 160683  0 4 0.01  .003 1.00 0.00
  0.00      0
Soil Series: Loring silt loam; Hydrogic Group C
 155.00   0.00  0  0  0  0  0  0  0  0  0
  0.00   0.00  0.00
    6
    1  13.00  1.400  0.385  0.000  0.000  0.000
      9.90E-4 9.90E-4  0.000
        0.100  0.385  0.151  2.180  59.27
    2  23.00  1.400  0.370  0.000  0.000  0.000
      9.90E-4 9.90E-4  0.000
        1.000  0.370  0.146  0.490  13.32
    3  33.00  1.400  0.370  0.000  0.000  0.000
      9.90E-4 9.90E-4  0.000
        1.000  0.370  0.146  0.160  4.39
    4  30.00  1.450  0.340  0.000  0.000  0.000
      9.90E-4 9.90E-4  0.000
        1.000  0.340  0.125  0.124  3.37
    5  23.00  1.490  0.335  0.000  0.000  0.000
      9.90E-4 9.90E-4  0.000
        1.000  0.335  0.137  0.070  1.90
    6  33.00  1.510  0.343  0.000  0.000  0.000
      9.90E-4 9.90E-4  0.000
        1.000  0.343  0.147  0.060  1.63
    0
  WATR   YEAR     10   PEST    YEAR     10   CONC    YEAR     10  1
    1
    1 -----
    7   DAY
  PRCP   TSER  0  0
  RUNF   TSER  0  0
  INFL   TSER  1  1
  ESLS   TSER  0  0  1.E3
  RFLX   TSER  0  0  1.E5
  EFLX   TSER  0  0  1.E5
  RZFX   TSER  0  0  1.E5
```

MB46950 - EXAMS Output File for Index Reservoir (C:\hetrick\przm\przm3\przm312\MB950\M950ir1.out)

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1964	1.803	1.758	1.629	1.465	1.326	.592
1965	1.017	.990	.893	.726	.635	.451
1966	.662	.650	.595	.505	.453	.343
1967	1.103	1.072	1.007	.909	.883	.504
1968	.655	.640	.603	.536	.492	.369
1969	.424	.414	.377	.314	.285	.235
1970	1.205	1.170	1.085	.955	.886	.440
1971	.678	.661	.596	.499	.496	.447
1972	.419	.410	.396	.352	.328	.237
1973	.605	.595	.475	.433	.406	.289
1974	.690	.677	.647	.619	.575	.417
1975	1.066	1.043	.967	.813	.728	.440
1976	1.060	1.031	.939	.848	.858	.516
1977	.680	.664	.605	.544	.528	.451
1978	.426	.419	.394	.369	.347	.294
1979	2.453	2.402	2.249	1.962	1.777	.924
1980	.794	.779	.754	.710	.678	.517
1981	1.447	1.420	1.272	1.017	.898	.491
1982	2.069	2.011	1.868	1.674	1.579	.867
1983	1.139	1.113	1.028	.934	.865	.614

SORTED FOR PLOTTING

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
.048	2.453	2.402	2.249	1.962	1.777	.924
.095	2.069	2.011	1.868	1.674	1.579	.867
.143	1.803	1.758	1.629	1.465	1.326	.614
.190	1.447	1.420	1.272	1.017	.898	.592
.238	1.205	1.170	1.085	.955	.886	.517
.286	1.139	1.113	1.028	.934	.883	.516
.333	1.103	1.072	1.007	.909	.865	.504
.381	1.066	1.043	.967	.848	.858	.491

.429	1.060	1.031	.939	.813	.728	.451
.476	1.017	.990	.893	.726	.678	.451
.524	.794	.779	.754	.710	.635	.447
.571	.690	.677	.647	.619	.575	.440
.619	.680	.664	.605	.544	.528	.440
.667	.678	.661	.603	.536	.496	.417
.714	.662	.650	.596	.505	.492	.369
.762	.655	.640	.595	.499	.453	.343
.810	.605	.595	.475	.433	.406	.294
.857	.426	.419	.396	.369	.347	.289
.905	.424	.414	.394	.352	.328	.237
.952	.419	.410	.377	.314	.285	.235
1/10	2.042	1.986	1.844	1.653	1.554	.842

MEAN OF ANNUAL VALUES = .472

STANDARD DEVIATION OF ANNUAL VALUES = .179

UPPER 90% CONFIDENCE LIMIT ON MEAN = .532

EXAMS INPUT FILE
FIPRONIL

1Exposure Analysis Modeling System -- EXAMS Version 2.97, Mode 3
Chemical: 1) Chemical Data Entry Template

Table 1.01.1 Chemical input data for neutral molecule (Sp.#1).
*** Chemical-specific data: SET via "entry(1)"
MWT: 4.37E+02 VAPR: HENRY: KOW:
KVO: EVPR: EHEN: KOC: 7.27E+02
*** Ion-specific data: "entry(1, 1)"
SOL: 2.40 KPB: KPS:
ESOL: KPDOC:
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 8.57E-04 QTBAW: 2.00 KBACS: 8.57E-04 QTBAS: 2.00
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 8.57E-04 QTBAW: 2.00 KBACS: 8.57E-04 QTBAS: 2.00
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 8.57E-04 QTBAW: 2.00 KBACS: 8.57E-04 QTBAS: 2.00
*** Reactivity of biosorbed species: "entry(4, 1, 1)"
KBACW: 8.57E-04 QTBAW: 2.00 KBACS: 8.57E-04 QTBAS: 2.00

Photochemical process data; Ion-specific data: "entry(1, 1)"
KDP(1, 1): 1.81E-01 RFLAT(1, 1): 0.0 LAMAX(1, 1): 0.0
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"

K1O2: EK1O2: KOX: EOX:
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
K1O2: EK1O2: KOX: EOX:
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
K1O2: EK1O2: KOX: EOX:
QUA(1,1, 1) QUA(2,1, 1) QUA(3,1, 1)
Light ABSORption (n,1, 1): (1) (2)

(3)	(4)	(5)	(6)
(7)	(8)	(9)	(10)
(11)	(12)	(13)	(14)
(15)	(16)	(17)	(18)
(19)	(20)	(21)	(22)
(23)	(24)	(25)	(26)
(27)	(28)	(29)	(30)
(31)	(32)	(33)	(34)
(35)	(36)	(37)	(38)
(39)	(40)	(41)	(42)

EXAMS INPUT FILE
MB46136

1Exposure Analysis Modeling System -- EXAMS Version 2.97, Mode 3
Chemical: 1) Chemical Data Entry Template

Table 1.01.1 Chemical input data for neutral molecule (Sp.#1).
*** Chemical-specific data: SET via "entry(1)"
MWT: 4.51E+02 VAPR: HENRY: KOW:
KVO: EVPR: EHEN: KOC: 4.21E+03
*** Ion-specific data: "entry(1, 1)"
SOL: 1.60E-01 KPB: KPS:
ESOL: KPDOC:
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
KAH: EAH: KNH: ENH:

KBH: EBH: KRED: ERED:
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00
*** Reactivity of biosorbed species: "entry(4, 1, 1)"
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00

Photochemical process data; Ion-specific data: "entry(1, 1)"
KDP(1, 1): 4.12E-03 RFLAT(1, 1): 0.0 LAMAX(1, 1): 0.0
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"
K1O2: EK1O2: KOX: EOX:
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
K1O2: EK1O2: KOX: EOX:
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
K1O2: EK1O2: KOX: EOX:
QUA(1,1, 1) QUA(2,1, 1) QUA(3,1, 1)
Light ABSORption (n,1, 1): (1) (2)
(3) (4) (5) (6)
(7) (8) (9) (10)
(11) (12) (13) (14)
(15) (16) (17) (18)
(19) (20) (21) (22)
(23) (24) (25) (26)
(27) (28) (29) (30)
(31) (32) (33) (34)
(35) (36) (37) (38)
(39) (40) (41) (42)
(43) (44) (45) (46)

EXAMS INPUT FILE
MB46513

1Exposure Analysis Modeling System -- EXAMS Version 2.97, Mode 3
Chemical: 1) Chemical Data Entry Template

Table 1.01.1 Chemical input data for neutral molecule (Sp.#1).
*** Chemical-specific data: SET via "entry(1)"
MWT: 3.89E+02 VAPR: HENRY: KOW:
KVO: EVPR: EHEN: KOC: 1.29E+03
*** Ion-specific data: "entry(1, 1)"
SOL: 9.50E-01 KPB: KPS:
ESOL: KPDOC:
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"

KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.18E-05 QTBAW: 2.00 KBACS: 2.18E-05 QTBAS: 2.00
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.18E-05 QTBAW: 2.00 KBACS: 2.18E-05 QTBAS: 2.00
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.18E-05 QTBAW: 2.00 KBACS: 2.18E-05 QTBAS: 2.00
*** Reactivity of biosorbed species: "entry(4, 1, 1)"
KBACW: 2.18E-05 QTBAW: 2.00 KBACS: 2.18E-05 QTBAS: 2.00

Photochemical process data; Ion-specific data: "entry(1, 1)"
KDP(1, 1): RFLAT(1, 1): LAMAX(1, 1):
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"
K1O2: EK1O2: KOX: EOX:
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
K1O2: EK1O2: KOX: EOX:
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
K1O2: EK1O2: KOX: EOX:
QUA(1,1, 1) QUA(2,1, 1) QUA(3,1, 1)
Light ABSORption (n,1, 1): (1) (2)
(3) (4) (5) (6)
(7) (8) (9) (10)
(11) (12) (13) (14)
(15) (16) (17) (18)
(19) (20) (21) (22)
(23) (24) (25) (26)
(27) (28) (29) (30)
(31) (32) (33) (34)
(35) (36) (37) (38)
(39) (40) (41) (42)
(43) (44) (45) (46)

EXAMS INPUT FILE MB46950

1Exposure Analysis Modeling System -- EXAMS Version 2.97, Mode 3
Chemical: 1) Chemical Data Entry Template

Table 1.01.1 Chemical input data for neutral molecule (Sp.#1).
*** Chemical-specific data: SET via "entry(1)"
MWT: 4.21E+02 VAPR: HENRY: KOW:
KVO: EVPR: EHEN: KOC: 2.72E+03
*** Ion-specific data: "entry(1, 1)"
SOL: 1.00E-01 KPB: KPS:
ESOL: KPDOC:
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
KAH: EAH: KNH: ENH:
KBH: EBH: KRED: ERED:
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00
*** Reactivity of biosorbed species: "entry(4, 1, 1)"
KBACW: 2.06E-05 QTBAW: 2.00 KBACS: 2.06E-05 QTBAS: 2.00

Photochemical process data; Ion-specific data: "entry(1, 1)"
KDP(1, 1): RFLAT(1, 1): LAMAX(1, 1):
*** Reactivity of dissolved species: SET via "entry(1, 1, 1)"
K1O2: EK1O2: KOX: EOX:
*** Reactivity of solids-sorbed species: "entry(2, 1, 1)"
K1O2: EK1O2: KOX: EOX:
*** Reactivity of "DOC"-complexed species: "entry(3, 1, 1)"
K1O2: EK1O2: KOX: EOX:
QUA(1,1, 1) QUA(2,1, 1) QUA(3,1, 1)
Light ABSORption (n,1, 1): (1) (2)
(3) (4) (5) (6)
(7) (8) (9) (10)
(11) (12) (13) (14)
(15) (16) (17) (18)
(19) (20) (21) (22)
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(35) (36) (37) (38)
(39) (40) (41) (42)
(43) (44) (45) (46)